

NEW ZEALAND
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1948



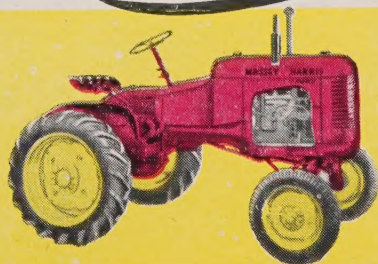
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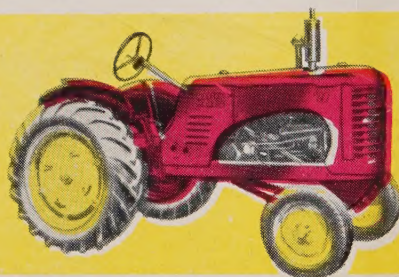
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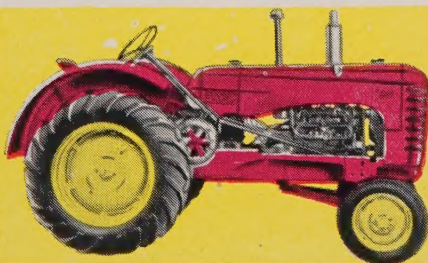
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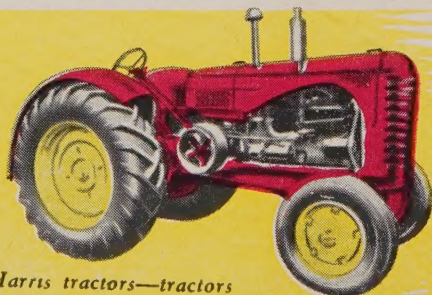


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NEW ZEALAND JOURNAL OF *Agriculture*

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Hon. E. L. Cullen,

Minister of Agriculture.

This month's cover



Typifying the endeavour New Zealand is making to increase the export of primary produce to give all aid possible to Britain in the present economic crisis, the sending of the barque Pamir from the Dominion to London has enabled an additional cargo of New Zealand produce to reach Britain. The Pamir arrived in London on December 23 after a voyage of 80 days, and was given an enthusiastic welcome by the people of Britain. This month's cover, which shows the Pamir leaving the Wellington Heads on October 3, was painted from a photograph by Photo News Ltd.

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CO-OPERATIVE RESEARCH WORK WITH THE FARMER



FARMERS in New Zealand have reason to be proud of their high standard of general farming practice. The efficiency of the primary production industry in the Dominion has been praised in all parts of the world. There can be no doubt that this highly-satisfactory state of affairs is due in no small measure to the utilisation with the minimum of delay of the findings of agricultural scientists in all the many fields that are covered by agricultural research.

That this is true speaks well for the progressive outlook of the farming community, but without a means of rapid dissemination of knowledge from the research worker to the farmer the maximum progress in the translation of research to farm practice cannot be achieved. The most important link between research work and the farmer is the advisory service, and the work of fields officers of the various Divisions of my Department in this connection has served as a model to many overseas countries and has been of inestimable value to the Dominion.

One of the most important means of demonstrating the value of results of research to the farmer by practical example on farmers' properties has been the co-operative research scheme of the Fields Division. In addition to this function the scheme has proved most valuable to the research worker as a means of enabling him to conduct experiments under New Zealand's wide range of soil and climatic conditions and under the differing types of farm management.

Many research projects cannot be carried out on research stations but fit in admirably to the co-operative experimental scheme. A case in point is the investigation of responses shown by pastures to fertilisers on the many differing soil types of the country; another is the study of the comparative yield and practical features of new wheat varieties in wheat-growing districts. There are few problems that do not at some stage require a more complete investigation than is possible at a research station.

The scheme does not, of course, in any way make the research station unnecessary—rather the reverse. It is from such institutions that fundamental advances are expected and without them no progress could be made. Again there are many types of investigations which cannot be carried out on farmers' properties because of the exacting supervision required and the upset such experiments would cause to normal farming operations.

The carrying out of research on farmers' properties and with their co-operation often necessitates modification of the straightforward carrying out of

farm operations, and my Department therefore is particularly appreciative of the assistance given by farmers in many of the research schemes. Of course the benefits the farmer receives from such work and the interesting nature of the trials in many cases repay him handsomely for his trouble, but it is the aim of my Department to reduce upset of normal farm operations to the minimum. Instructors of the Fields Division will lay down the trials and carry out all inspections and harvesting required. The co-operative farmer is asked to provide a plot of land—rarely exceeding half an acre—and to avoid treating it in any way which will upset the results. In practically no case will the plot of land under trial fail to yield to the farmer at least a high proportion of the production he would normally have secured.

The number of trials now open in various parts of New Zealand is approximately 700, covering a wide range of experiments such as pasture topdressing trials, pasture species and strains trials, trials with casting worms, pampas grass, chemicals for weed control, insecticides, surface sowing of pasture species, and trials with annual crops such as wheat, oats, barley, maize, potatoes, linseed, linen flax, turnips, swedes, rape, chou moellier, and lupins. Experiments are being conducted on soil types ranging from rich alluvial flats to the depleted country of Central Otago.

A great variety of types of trial is covered by the co-operative research scheme. The simplest types of trial are the observational plots which depend for accurate results on careful study by trained observers. Such experiments are a ready means of surveying large areas of country and they have yielded and continue to yield valuable and reliable information. The observational pasture topdressing experiments are a good example of this class, and when the results from several hundreds of these trials over a number of years are examined in conjunction with data from mowing trials at various centres and also soil and plant chemical analyses, definite recommendations can be made to the farmer regarding the type of fertiliser he should apply to particular soil types.

From this form of experiment the scheme covers progressively complex experiments, including wherever possible modern designs of trials with adequate replication of plots so that statistical analysis of the results is possible. Such analysis gives an accurate measure of the confidence which can be given to differences between experimental treatments.

There is, however, no end to the problems requiring investigation, and the expansion of the work is limited only by the availability of technical staff and equipment. My Department cannot do all that it would like to do, but the farmers of this country may rest assured that it will continue to seek with all means at its disposal ways and means of improving farming practice in all its phases.

EDWARD CULLEN, Minister of Agriculture.

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[R. C. Blackmore photo.]

HILGENDORF WHEAT OF OUTSTANDING BAKING QUALITY

A NEW wheat variety which has been developed at the Wheat Research Institute, Christchurch, and which promises to raise the quality of New Zealand bread beyond anything hoped for previously, has been named Hilgendorf after the pioneer of wheat improvement in New Zealand and the institute's first director, the late Dr. F. W. Hilgendorf. The institute has now decided to distribute this wheat, which has been included in a number of trials by the Fields Division of the Department of Agriculture, and this article contains preliminary notes on the new variety by O. H. Frankel, chief executive officer, and E. W. Hullett, chief chemist, Wheat Research Institute, in co-operation with officers of the Fields Division.

SINCE its first baking tests in 1942-43 Hilgendorf wheat has shown a very marked superiority over Cross 7 in the many trials in which they have been grown side by side, and even over Marquis, the standard for high quality, where this wheat was included.

Stocks of seed are being multiplied and the first crop of 10 acres of pure seed has been grown in the Rakaia dis-

trict. The first supplies should reach flourmills and bakehouses in two years' time.

Origin and Description

Hilgendorf was selected from the cross Tainui x Cross 7, which was made in 1937, the first small-scale yield and quality trials being conducted in 1942-43 and the first field trials in 1944-45.

In appearance Hilgendorf resembles more closely Tainui than Cross 7. It is short-strawed—slightly shorter than Cross 7—and has a short, stumpy head. Its grain, red-skinned like that of Tainui, is larger than that of Cross 7, and matures over a week earlier than Cross 7. It stands up well—almost as well as Cross 7—and, as far as is known, is a good header wheat.

Baking Quality

Baking tests in which Hilgendorf wheat was tested against Cross 7 were made on small samples from the variety trials conducted in the various wheat-growing districts. In the past season, however, sufficient seed was available for some larger areas of the new wheat, and some thirty sacks from the yield of 1-acre plots in Annat and Winchmore were made available for commercial milling and baking trials. They were milled in October under ordinary conditions at a Christchurch flourmill.

HILGENDORF WHEAT VARIETY



The bulk of this flour is intended for trials in commercial bakeries, but already several semi-commercial trials have been made at the institute. The results were fully up to expectations, and bakers who saw the bread agreed that it was comparable with bread made from Canadian flour. This was shown best of all by the exceptional keeping quality of the bread, which after a week was better than ordinary bread only two or three days old. This good keeping quality is to be expected from the very soft and finely-textured crumb of Hilgendorf loaves.

Good keeping quality has become of the greatest importance in New Zealand, because the five-day week applied in bakeries has the effect that much of the bread used on Monday has to be made on the previous Friday or even Thursday. In spite of intensive world-wide research, no ingredient has been discovered, except first-class flour, which improves the keeping quality of bread in the measure required under these circumstances. It is believed, therefore, that the introduction of Hilgendorf into commercial use will prove to be the most important advance ever made in the bread industry of this country.

Yields of Hilgendorf Wheat

As farmers cannot be expected to grow crops which do not promise an adequate return, it is important to discover whether the yield of Hilgendorf provides sufficient inducement for the wheat grower. The table on this page gives details of the trials that have been conducted with this variety.

[R. O. Blackmore photo.]

Details of Field Trials with Hilgendorf

Name of Co-operating Farmer	District	Date Trial Sown	Soil Type	Type of Trial
Wheat Research Institute	Lincoln	22/6/44	Dunsandel silt loam	Replicated
Wheat Research Institute	Lincoln	4/9/45	Dunsandel silt loam	Replicated
A. W. Taylor	Methven	6/6/45	Springfield clay and heavy silt loam	Replicated
B. Evans	Winchmore	2/6/45	Stony silt loam	Replicated
J. Simpson	Bulls	20/9/46	Alluvial loam	Replicated
J. A. Colquhoun	Masterton	17/10/46	Alluvial shingly loam	Replicated
F. J. Gorton	Oxford	18/6/46	Aylesbury silt loam, shallow phase	Replicated
J. B. & C. R. Bayley	Fernside	9/9/46	Recent silt loam	Replicated
J. B. & C. R. Bayley	Fernside	9/9/46	Recent silt loam	One acre block of Hilgendorf in field of Marquis
L. T. Wright	Annat	27/8/46	Medium silt loam	One acre block of Hilgendorf in field of Fife-Tuscan
A. M. Stephens	Barrhill	3/5/46	Barrhill silt loam	Replicated
C. A. Campion	Highbank	1/8/46	Wilson silt loam	Replicated
J. Kermode	Methven	17/6/46	Springfield clay loam	One acre block of Hilgendorf in field of Cross 7.
W. Lemon	Winchmore	16/5/46	Seafeld light silt loam	Replicated
L. V. Talbot	Temuka	6/8/46	Timaru silt loam	Replicated
W. Allan	Taiko	11/9/46	Claremont silt loam	Replicated
M. W. Austin	Maruakoa	16/5/46	Grey-yellow silt loam	Replicated
L. Paterson	Waikaka	8/10/46	Medium silt loam	Replicated
J. O'Callaghan	Dipton	19/9/46	Grey-yellow silt loam	Replicated
W. Baird	Dipton	19/9/46	Grey-yellow silt loam	Replicated

There is not yet sufficient information on the yielding ability of Hilgendorf, compared with that on WRI-Yielder, to permit definite conclusions as to Hilgendorf's place in New Zealand wheat farming. It has had only three years of field trials, with only a single trial in the first and three in the second. Altogether 17 replicated trials were harvested and in three of these Hilgendorf, being the earliest-maturing variety, was badly damaged by birds. Yet it is possible to gain a general impression of its yielding ability, to be confirmed or amended by further tests during the current season.

It is so far established that on medium to medium-heavy land yields of Hilgendorf tend to be similar to those of Cross 7, whether autumn or spring sown, but that on lighter land it tends to yield less than Cross 7. Further, under conditions of high fertility and rainfall where very high yields are normally expected, as in the Rangitikei and in Southland, Hilgendorf has on occasions yielded substantially less than Cross 7. On the other hand in a trial at Barrhill, Rakaia, Hilgendorf yielded 65.7 bushels per acre, 6.3 bushels more than Cross 7.

In addition to these accurate yield trials, three 1-acre observation areas were laid down in the past season by farmers in the Fernside, Annat, and Ashburton districts. They were situated in crops of Marquis, Fife-Tuscan, and Cross 7 respectively; the first and second were sown in the spring, the third in the autumn. All three growers thought well of the new wheat and are repeating their trials on larger areas this year. Yield estimates by the Fields Division, based on a large number of samples of both varieties taken along the dividing line, showed in each case that the yield of Hilgendorf was closely similar to that of the main variety.

In considering results from comparative yield trials it must be borne in mind that Hilgendorf stools less than Cross 7 or Fife-Tuscan and the plant has fewer heads. Moreover, its larger grain gives fewer plants when sown at equal rates of seed. During the current season the institute and the Fields Division have laid down a number of trials with increased rates of seed against the standard one, in the hope that this may raise the yield of the new wheat.

The limited experience to date warrants the impression that Hilgendorf is not an all-round wheat like Cross 7, Fife-Tuscan, or WRI-Yielder, which can be grown without risk almost anywhere in New Zealand. The conditions under which Hilgendorf can be grown to advantage are more restricted. It seems that this is the case on the

... HILGENDORF WHEAT VARIETY

medium and medium-heavy classes of soil in Canterbury, where it has yielded either the same as, or slightly less than, Cross 7. Soil conditions or localities may be found in which the new wheat will prove of particular advantage, as is indicated in the successful trial at Barrhill.

A Premium Wheat

Unless some specially-suitable localities are found, the new wheat must be considered to have no clear advantages from the grower's point of view over existing varieties. If on the grounds of its baking quality it is to be widely encouraged, an inducement for the farmer may prove necessary.

There are a number of precedents. Hunters has received, and still receives, a premium of 2d. per bushel, although it is by no means superior to other wheats. Marquis, till now the highest-quality wheat, has a premium of 6d. Cross 7 when first distributed received 2d. It is, therefore, pleasing to advise that the Price Tribunal has agreed to a premium of 1s. a bushel above Tuscan rates for Hilgendorf wheat in the harvest of 1949.

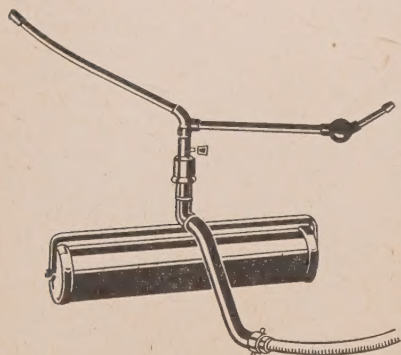
Hilgendorf wheat, because of its very marked superiority in baking quality over other wheats commonly grown in New Zealand and its yielding ability, which approaches that of the highest-yielding New Zealand wheats, marks a distinct advance in wheat breeding. Though a considerable number of trials have been conducted by the institute and by the Fields Division of the Department of Agriculture, no clear picture can be given of the conditions under which satisfactory yields, by New Zealand standards, may be obtained. On present indications it appears unlikely consistently to outyield Cross 7 in any locality, and may yield considerably less than Cross 7 where very high yields are normally expected. On medium wheat land in Canterbury, however, the yields of Hilgendorf tend to be similar to those of Cross 7. The results of trials in the present season will no doubt enable more definite recommendations to be given as to the places where good results may be expected with confidence from the new variety. In the meantime seed supplies are being built up and the first crop of 10 acres of seed is now growing under certification in the Rakaia district. There will be enough seed for about 200 to 250 acres to be sown in 1948, and for 3000 acres in 1949.



[R. O. Blackmore photo.]

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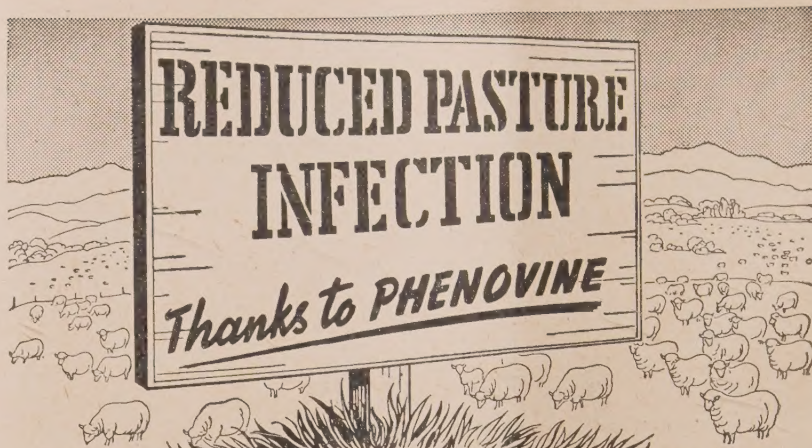
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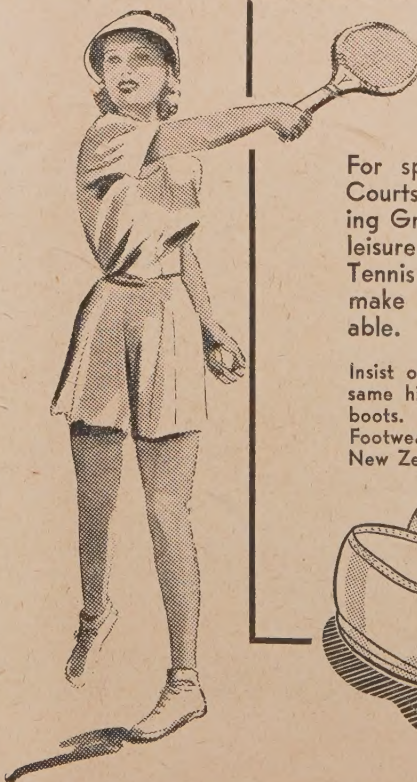
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COMBATING SAND INVASION OF FARMLANDS

By H. deO. CHAMBERLAIN,
Instructor in Agriculture, Palmerston North.

THERE have been no disastrous invasions of sand in New Zealand comparable with those in some other countries where moving sands have engulfed and laid waste entire coastal districts. Here there have been no spectacular losses of homes or stock, but there are areas where sand is insidiously encroaching on farmlands, and in this article methods of combating moving sand and saving valuable acres for production are described.

ON the west coast of the Wellington Province sand is insidiously eating into farmlands, reducing the cultivable area, and causing thousands of pounds' worth of damage. In February of last year a sudden gale caused considerable sand-dune movement in the Himatangi-Foxton area, and one large dune, moving several feet in one night, now towers menacingly above houses and gardens, leaving them at the mercy of any new wind attack. In addition, a few more acres of previously-grassed land which was contributing to the food supply of the world has disappeared beneath 10ft. of loose and shifting sand.

Sand stabilisation in some areas is a very large undertaking and is beyond the financial and physical power of a farmer to attempt on his own, but where moving sand menaces a farm some protective work can be done comparatively cheaply to ensure that valuable areas are not lost to production.

The term "sand country" covers large tracts of soils physically different but fundamentally the same. The so-called "heavy" sand flats, a few miles from the foreshore,

were once foreshore, but have been built up naturally above sea level or have been so deeply covered by moving sand as to seem the same as natural sand. These areas, because of gradual consolidation and the decay of plants through many years, are capable of carrying excellent grass.

Immediately behind the foreshore lie large areas of flats and hills of raw sand, which are impossible to grass by ordinary methods, not necessarily because these soils contain insufficient plant food, but rather because the physical and mechanical condition of raw sand make the growing of grass impracticable until the topsoil has been given consolidation and preparation by use of "forerunning" plants which can stand loose conditions and the force of blowing sand.

Ordinary grass or crops cannot be grown immediately, because sand particles are coarse and do not stick together, because the surface layer will not hold moisture and is easily wind-blown, and because there is an almost complete lack of humus and consolidation.

If good grass is to be grown on raw sand, the physical and mechanical condition of the sand must be modified to make it hold water. This is done by supplying humus in the form of decaying plants.

Topography

The main sand country can be divided into two groups—dunes and stabilised sandhills and flats.

The dune area is made up of large and small hills of sand, irregular in shape, either completely bare or showing small patches of scanty vegetation with valleys so scoured by the winds as to allow quite large lakes or ponds to form where conditions are suitable.

Within these more or less stationary dunes are more huge masses of sand blown together like snowdrifts or

STAGES IN BUILDING THE FORE DUNE

FIRST STAGE

The fore dune is the guardian of coastal sand country. Sand coming in from the coast is stabilised by the maintenance of a permanent fore dune. A break is mended by the erection of brush fences over which the sand forms a dune. When the dune is high enough various sand-binding plants can then be introduced.

SECOND STAGE

THIRD STAGE

frozen waves, called wandering dunes. It is these wandering dunes which cause loss of land and property, even though they have the somewhat dubious advantage of levelling out and building up the dune country through which they pass.

In dune country the soil is loose and of broken contour; it lacks cohesion and surface moisture and is, therefore, subject to rapid drying and displacement by wind. Exposed to relentless and continuous salt winds from the sea, it is for ever being scoured, rebuilt, and dried out.

To grass this country successfully it is necessary to consider first the use of the flatter areas, but before this can be attempted the hills must be fixed in a permanent position. To do this certain definite principles must be very carefully observed, or not only will the efforts fail, but large areas of consolidated sand further back and already in grass may also be ruined for many years.

The Fore Dune

Winds from the sea carry dry sand up shore until, either because it meets some obstacle such as driftwood or because of its own weight, it piles into a ridge which follows faithfully every contour of the coast. If the supply of sand is fairly uniform, an even, rather flat-topped ridge will be formed, which is usually invaded sooner or later by such native sand-builders as silver sand grass (*Spinifex hirsutus*) or pingao (*Scirpus frondosus*). The lee side of the ridge is usually bare sand.

This fore dune is of first importance, because while it stands guard over the coastline the greatest amount of sand is cut off from the inner dunes, which tend to remain more or less stable. Immediately the fore dune is cut by wind or is washed away by a high tide, alteration in the inland dunes takes place, existing dunes being flattened and other dunes being formed further inland, often at the cost of land already under grass.

Making a Fore Dune

If no natural fore dune exists and the topography of the shore shows large areas of flat beach rising gradually by small ridges to large bare dunes, it is essential to create a fore dune artificially before any attempt is made to stabilise the inland-moving sands.

This is simply effected by the erection of two or three parallel brush fences on the foreshore 8ft. apart and as near as possible to the high-tide mark. These fences arrest the inward drift of the sand and cause it to pile more or less rapidly into a dune. To gain height a similar fence is constructed at the top of the new dune as soon as it covers the first fence. When this in turn has disappeared under the

sand, stabilisation can be assisted by introducing special binding grasses.

Though there are vast areas of dune country the taking over and securing of which are impracticable because of various factors, it is both practicable and profitable to bring into production large areas of loose sand on the seaward edge of many coastal farms. Many of these areas are not merely unproductive but are an ever-present menace to the consolidated grassland at the inner edge.

Binding the Sand Dunes

Both inland dunes and fore dunes must be fixed in position and protected from the scouring effect of heavy winds. Plants used for the purpose must be capable of rapid upward growth and of forming a free root system along their stems. The leaves, too, must be tough enough to withstand the cutting action of blown sand and the desiccation of sea winds.

Types of Plants

Plants used on the dunes may be divided into sand binders and sand collectors, the main difference between the two being their ability to withstand heavy sand flow. Those which not only collect sand but also possess an immense rooting system with the ability to root at all nodes along their stems as soon as inflowing sand rises about them are the true sand binders; plants which because of their habit of growth can collect sand but cannot bind it, because their ability to root at the nodes is limited, are classed as sand collectors. Each type can play a useful part in the reclamation of sand country, the sand binders on the fore dunes and immediately behind them and the sand collectors further back still.

Sand Binders.

Marram Grass (*Ammophila arenaria*) is the most important sand binder and is particularly suited for stabilising the fore dune. It has a far-creeping, very branching, stout underground stem which sends up close regiments of leaf-bearing branches. Marram grass also sends out other horizontal underground stems which grow at great lengths from the parent plant to form colonies. These are somewhat irregular and their formation depends rather upon the variability and speed of the sand flow. Marram plants are extremely dense and root freely at the nodes, which allows them to grow upward above the sand, provided drift is not prolonged and severe enough to bury the plants completely.

Marram grass cannot exist without shifting sand; if the sand supply fails the grass ultimately turns yellow and dies.

... PLANTS USED ON THE DUNES

Spinifex. Second in importance as a plant for dunes is silvery sand grass (*Spinifex hirsutus*), whose extremely long, quickly-growing, and much-branched rhizome, which seems capable of unlimited extension, is specially adapted for existence in the sand drift. This rhizome differs from the creeping root of marram grass in that it grows along the surface of the ground, rooting at the nodes. It is quickly buried by the sand, but rapidly sends leafy shoots up to the light.

The track of the covered rhizomes is revealed by the lines of leafy branches which pierce the sand at intervals, and, unlike those of marram grass, are open rather than densely crowded, so that sand can always be seen through the leaves.

The seed heads of the female plants are spiky and round and when ripe can be seen blowing over the surface of the sand until they reach some sheltered place in which germination can take place. Many of these seed heads, however, are deeply buried by moving sand and fail to produce plants.

Spinifex's one drawback is that it is much liked by stock, and for this reason it should not be planted alone but always with marram grass. If stock, which are normally kept off fore dunes, should happen to invade areas where spinifex is growing alone, damage which could take years and much money to repair might be done.

Pingao. The last sand binder of major importance is pingao (*Scirpus frondosus*), a plant found naturally only in New Zealand. Pingao is efficient because of its very long, much-branching rhizome, which creeps to great distances just below the surface of the sand. The apex of the rhizome continually seeks the surface, where it breaks into close tufts of leafy shoots. The apex is soon buried by sand flow, when it continues, its journey before again seeking the light, leaving the tufty leaves to grow rapidly along its line of march.

Pingao grows vigorously only in the presence of abundant moving sand. Though the plant lives on in hollows and sheltered places where the sand is consolidated, in such locations it is usually stunted and shows no rhizome development.

Sand Collectors.

The most important of the sand collectors are *Coprosma acerosa* and *Pimelea frondosus*; sand fescue (*Festuca littoralis*) also does useful work, particularly on sand plains where the drift is not very aggressive.

Both *Coprosma acerosa* and *Pimelea frondosus* are native shrubs which grow on most New Zealand dune areas. They are both low growing, but *Coprosma acerosa* forms flat cushions made up of wiry, interlacing orange

VALUABLE SAND-BINDING PLANTS

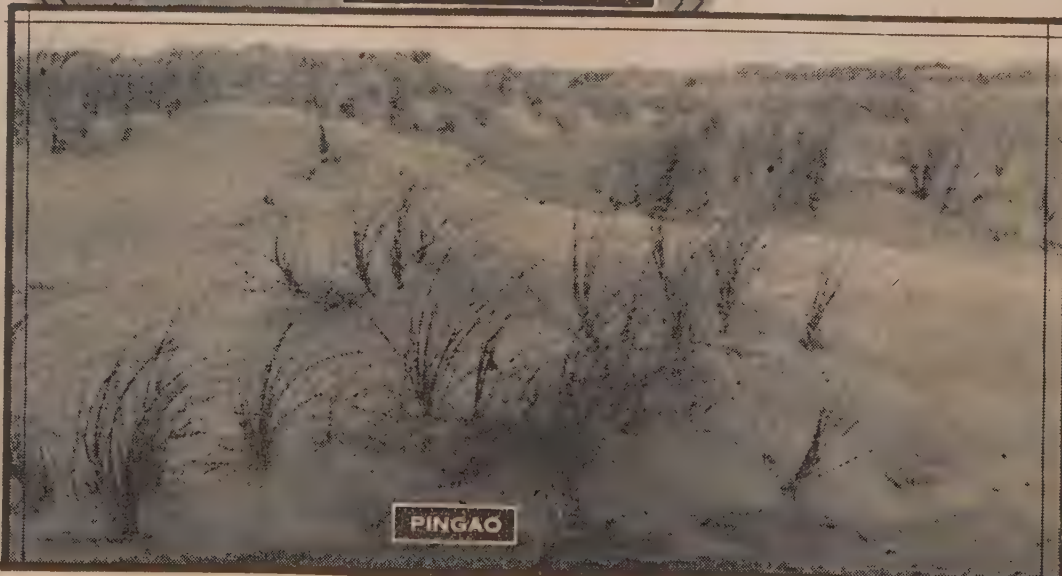


MARRAM GRASS



SILVERY SAND GRASS

Marram grass, which is neglected by stock, is recognised throughout the world as being of great value in binding moving sand. Silvery sand grass, native to the warmer sand country of New Zealand, is palatable to stock and therefore liable to be eaten out. Pingao grows well only where moving sand is abundant.



PINGAO

... DUNE PLANTING AND MAINTENANCE

twigs. The roots are very long, but short roots are also given off from the twigs as they become buried, allowing the plant to rise to some extent above the moving sand. The pimelea, on the other hand, is a much closer-growing shrub whose branchlets form close masses. The main stems are usually buried and have the power of growing in length after being covered.

The topmost branches root when covered with sand. Both plants can continue to grow upward and live in slow drifts inland from the fore dune, but they cannot survive heavy and prolonged drift.

Sand Fescue. Sand fescue forms close-growing tussocks which may be as tall as 2ft. above the surface of the sand. It has underground stems capable of moderate extension when buried, new roots arising near the base of the leaves.

On the west coast this grass is seldom found in any quantity on a gathering fore dune, but establishes fairly rapidly on the dunes immediately behind and on flats and dunes further inland. Sand fescue seeds prolifically and the seeds are blown far and wide by the wind. Germination takes place mostly in hollows and the plants produced induce the collection of low dunes. On the tall hills few seeds germinate because of the rapid on-piling of sand.

Selecting the Plants

The first step in binding the dunes is to plant marram grass. New plants are taken from established ones near at hand by taking up runners of a size suitable for planting, or, if necessary, pulling them to pieces, taking care that each new plant consists of a good piece of stem with leaves attached, the stem having at least two nodes or buds at the base. As new plants must be fresh and vigorous, parent plants of about two years old are best.

Indiscriminate cutting up of old plants is not good, as sections of the old plants do not grow as well as young ones, and also a gap is left in the old plantation.

Since freshness is of major importance, if no established plants are handy to the planting area, a nursery must be established and the main planting put off until new shoots are available.

Plants should be tied in bundles convenient to carry under the arm, and the bundles should then be "heeled in" moist on the area to be planted. Roots must not be allowed to become even a little dried.

Planting

When planting, the leaves should be cut back to about 15in. long to prevent excessive transpiration and to reduce wind resistance and the weight of the bundles. This is usually unnecessary where young side plants are available.

Plant 2 to 3ft. apart at right angles to the wind and place the second row behind the gaps in the first. Use a spade for planting, pushing it well into the moist sand underneath the surface and working it backward and forward and from side to side to make a long, V-shaped hole. Put in three plants along the width of the hole and "heel in" well.

After-care consists of replacing at once any plants which have not "taken." Gaps cause wind-gullying, which spells quick ruin for the whole plantation.

When this work is done and the fore dune has become stabilised reclamation can be started in earnest.

Fore Dune Maintenance

Caring for the fore dune after it has been established calls for unremitting watchfulness. Cattle must be kept off the area not only because their hooves do considerable damage, but because spinifex is well liked by stock and plants of this species will soon be eaten out completely.

Vandalism. In some areas where rights to collect sea shells have been let no clauses have been inserted in the agreement to guard against damage to the fore dune. In consequence, dunes have been opened up to allow access to existing deposits just behind them or to make a trap for new deposits brought in by the sea. The results of this vandalism are disastrous to the dunes further inland and the scouring effect upon the fore dune itself soon results in whole sections being blown out.

In addition to these avoidable and unforgivable attacks on the seaward rampart, breaches are occasionally made by uncontrollable natural agents. These must be repaired without delay, the gaps being filled by brushwood fence to build up the weak points before the adjoining dune can become eroded.

Material for repairs. Plants to be used for fences must recover sufficiently after cutting to hold the sand in which they are growing and to provide a second crop if necessary. Manuka brush is commonly used to collect the fore dune. It is very suitable for the purpose and very often good supplies grow reasonably near.

When, however, the land behind the fore dune is in process of consolidation and improvement, manuka scrub disappears and may have to be carted from places a long way from the fore-shore. It is necessary and economical then to grow behind the fore dune areas of shrubs which will stand up to the difficult conditions of growth and yet not become a nuisance themselves.

Useful plants. Tamarisk shows good possibilities for this purpose. It stands severe trimming very well, will grow

briskly in raw sand if some shelter is given in the early stages of growth, and is impervious to salt sprays.

The Chatham Island akeake (*Olearia traversii*) is another shrub of quick-growing and densely-branched habit. Salt sprays, even direct from the fore-shore, do not harm it, and it should certainly have a place in any planting made close to the sea.

Introduction of Humus

In the lee of the dunes there is little if any movement of sand, and the second step of pasture establishment is started here. The first objective is to increase the humus in the soil so that consolidation and retention of soil moisture can be attained. Of all plants for this purpose tree lupin is by far the best yet known. Lupins strike best on this soil if branches bearing mature pods are scattered over the ground. If there are no lupin bushes near the area to be sown, it is sufficient to broadcast pods containing ripe seeds. These are better and surer methods than sowing seed direct to the soil, as seed is likely to become buried by the shifting sand.

A recent experiment, however, shows some promise where rushes are growing near at hand. Rushes were dug from the flat and placed in rows 6ft. apart over the dunes, and lupin seed was drilled just into the moist sand by mechanical planter. The strike was comparatively good, and an improvement in the method of setting out the rushes may encourage its extensive use in suitable situations.

A simple method: On areas where drift is moderate lupins can be grown by setting firmly three pieces of twiggy manuka in the form of a triangle and putting in two or three lupin seeds. The seed will also take comparatively well when dropped into the centre of fairly open marram or spinifex plants.

Tree lupin is used for the sole purpose of increasing humus and nitrogen in the soil; it is not itself a sand binder and cannot live unless a fore dune has been consolidated with marram grass. Stock will not eat it. Near the shore but behind the fore dune both flats and hills may be sown with lupins. Further back the dunes only are sown, the eroded flats becoming naturally choked with rushes or native grasses.

The First Pasture

After four years the soil will be greatly enriched with humus and nitrates. At this stage lupins will in some cases begin to die out in patches, and the first stage of pasture establishment is reached. Usually, however, fresh lupin plants take the place of dying trees and no patches appear. In this case crushing by tractor is resorted to on flats and low hills, care being

FROM LUPINS

TO

PASTURE



ESTABLISHING LUPINS



READY TO FARM

Tree lupins sown with a mechanical planter grow well in the lee of old rush roots. After consolidation fertility is built up through the use of lupins, and pastures established on the former sand country can then be maintained as long as the ridges are kept intact.



ESTABLISHED PASTURE

PASTURE MIXTURES AND ESTABLISHMENT



The final stage: Good, clover-abundant pastures fit for dairying.

taken to leave suitable patches standing until grass is established on the crushed area. Some of the crushed lupin is left lying in place, unless consolidation is particularly well advanced. On no account, however, must the dead wood be burned, as this will certainly lead to fresh sand blows and the destruction of several years' work.

Another point in favour of leaving some crushed scrub in position is that the shade provided keeps the topsoil cooler and prevents soil moisture from being lost.

Buffalo grass. Where the lupin has thinned out naturally much success has attended the planting of buffalo grass in the bared spaces. This grass, if planted among marram or spinifex, is also extremely useful on low hills and plains behind the fore dune, as it forms a dense pasture proof against wind and stock.

Paspalum can also be planted, but it takes a considerable time to adjust itself to west coast conditions and is really unsuitable south of the Rangitikei River. Where planting cannot be undertaken on large areas seed can be used. In both cases quicker-establishing plants must be oversown to provide cover until the slower-growing grasses are established.

Types of Grasses

For this purpose there are no better grasses than browntop, prairie grass, *Poa pratensis*, sweet vernal, Yorkshire fog, and ryegrass. Clovers should include *Lotus hispidus*, King Island melilot, English trefoil, white and red

clover, and subterranean clover. While King Island melilot is not in itself a progressive plant in competition with others, and stock do not like it much, it is a valuable humus former and a very free seeder. Consequently, if sand blows do appear or, worse still, fire sweeps the area, the King Island melilot will germinate thickly in a very short time and often save untold damage. Some of the plants mentioned, as, for example, melilot, are not at present obtainable, but this no doubt will be remedied later, and when they are available they should not be overlooked.

Grass Mixtures

Mixtures for sowing among the lupins vary according to conditions and the types of seed which can be bought. The best grasses are perennial ryegrass, browntop, Yorkshire fog, prairie grass, sweet clover (King Island melilot, for preference), sweet vernal, *Lotus hispidus*, subterranean clover, and *Poa pratensis*. A standard mixture which has given excellent results in recent years is:—

	lb.
Perennial ryegrass	6
Browntop	1
Yorkshire fog	4
Prairie grass	6
Sweet vernal	2
Sweet clover	2
<i>Poa pratensis</i>	1
<i>Lotus hispidus</i>	2
Subterranean clover	3
Total	27lb.

Seeds bought "off the mill" are suitable. In the sowing of normal pastures purity of seed is one of the first

considerations. On raw sand, however, germination is of first importance and purity second, as many weeds are useful in providing a quick temporary cover in the first place. This makes possible the purchase of seeds direct "off the mill" and greatly reduces the cost of grass mixtures.

The mixture quoted was purchased this year at 30s. an acre, the ryegrass being bought "off the mill" and containing a considerable amount of trefoil and fog with some goose grass. The germination was 82 per cent. After it was sown sheep were driven over the area to cover the seed and to give greater consolidation.

Stocking

When grass is well established among the lupin, feeding off can be considered. Both cattle and sheep may be used, but they must be under frequent observation to prevent too close grazing and injury to the sward. Grazing stock will gradually break down the surrounding live lupin bushes, thus preparing the way for further sowings, which must be made as soon as the bushes thin out. Stock must be removed at once if any breaks of bare sand appear, and if reversion to bare areas is too severe, the spaces must be planted with fog, buffalo grass, or even marram grass. In cases where reversion to bare areas is very slight and the black soil has not been removed, the covering of the area with brush will usually allow natural grasses to cover in the break. If the season is not propitious for planting, the breaks may be covered with lupin, manuka, or flax until sufficient rain falls to enable planting or

COMBATING WANDERING DUNES



Sand blows are an ever-present menace, not only on the dunes but also on the flat. Stockyards and gateways are common sources of trouble, and protection in the form of shelter belts is essential.

sowing to be done. In any case the fore dune must be fenced from stock, as it is easily broken and a break there may be irretrievable before the newly-established sward is covered by sand.

The Wandering Dune

Frequently there are within the dunes banked areas of loose sand which move further and further inland along the course of the gullies and over the plains. These wandering dunes, as they are called, must be arrested as quickly as possible and turned into pasture.

The first step is to plant marram grass from the source to the termination of the drift. As, unlike the case of the fore dune, the marram is needed merely to fix the sand already present and not as a permanent catchment factor, the plants which will grow readily in raw sand may be interplanted.

The giant ice plant. The most valuable plant for this interplanting is *Mesembryanthemum edule*, the large ice plant, which soon forms a dense cover between the clumps of marram. As giant ice plant thrives only in loose sand, as soon as consolidation

takes place the cover begins to die out. In these places grasses and clovers can be sown successfully and the foundation of a pasture laid.

The work of binding and stabilising a fore dune and the subsequent breaking in of the back country can be attempted by individuals only where comparatively small areas are concerned. Similarly, large wandering dunes, because of their exceptional dryness, rapid movement, and often huge size, are generally beyond the capacity of the individual to develop, unless they are directly menacing a farmer's fields.

Small areas can be tackled by the farmer, however, with paying results, and some of the smaller wandering dunes must be stabilised to prevent the covering of marginal lands which may be in good grass.

Sand Plains

Throughout the dunes are large and small areas of flat land which have become naturally stabilised and covered with vegetation of various sorts. On the west coast this covering may be self-sown lupin, bracken, rushes, sedges, and a variety of grasses from Yorkshire fog and English trefoil to

sweet vernal, browntop, tall fescue, suckling clover, and strawberry clover. The plains themselves are often quite damp and fertile, but the hills and ridges at their margins are very subject to summer drying, and therefore to being broken by stock. Under these conditions the hills may easily revert to wandering dune condition and menace the plains.

Establish the hills with trees. It is safer, therefore, to plant such hills with conifers of the muricata type and thus fix the dunes for ever, beside giving much-needed shelter to the plains and supplying a certain amount of timber for judicious cutting later on. If the plain areas are very small, however, lupins should replace the trees on the surrounding hills, as too much shade can be almost as harmful as too little shelter.

Breaking in the Plains

The stabilised plains themselves present little difficulty in breaking in to grass. To make ploughing easier and more efficient, it is better to cut scrub and rushes and rake these off into windrows where they can be safely burned. On no account must burning take place over the areas as a whole, as this not only destroys humus but predisposes the top to wind blowing.

Ploughing should be across the direction of the prevailing wind as deeply as the roots of the top growth enter the soil, usually from 6 to 8 in. Rolling on the furrow, using a heavy roller, and discing down quickly in the same direction as the ploughing give greater consolidation. After being rolled again and harrowed immediately, the area may be sown. The whole operation should be completed as quickly as possible.

Sowing

The time of breaking in sand plains is dictated by seasonal conditions and the amount of shelter available about the edges. As the greatest care must be taken in exposed positions to prevent or minimise sand blowing, cultivation should not be undertaken during a dry and windy spell of weather.

On west coast sands land can generally be broken with safety from March to the end of April, but sowing after this is often attended by damage to clovers from frost.

Nurse Crops

If sowing cannot take place in these two months, it should be left until August or September, but never later than mid-October, as the sand heats rapidly after that time and burning of the young seedlings will detract from the success of establishment.

In both cases some form of cover or nurse crop should be used with the seed, the best crops for this purpose being ryecorn, oats, or barley sown at 30lb. per acre. These crops are quick

COMBATING WANDERING DUNES . . .

growing and act as a temporary protection against wind damage, frost, or heat in early summer, and sown at the rate suggested they do not unduly shade the grass.

Drill the Seed

On sand land grass seed is better drilled in at about $\frac{1}{2}$ in. to 1 in. deep so that the seed is put well into the moister soil. For this purpose cross-drilling is practised, half the seed being drilled each way, with a rolling between each drilling to prevent the first sowing being buried too deeply. This also has the effect of concentrating the manure immediately below the grass and so stimulates faster early growth and tillering.

The last drilling should be in the same direction as the ploughing—that is, at right angles to the prevailing wind, as the slight ridges left by the drill also act as a deterrent to blowing.

Grass Mixtures

On the plain country a normal grass mixture may be sown, but Italian ryegrass should be included as a quick cover. A useful standard mixture is as follows:—

	lb.
Italian ryegrass	10
Perennial ryegrass	20
<i>Poa trivialis</i>	3
White clover	1
Subterranean clover	2
Strawberry clover	2
Broad red clover	2
Total	40lb.

With the exception of the *Poa trivialis* and strawberry clover, Certified seeds of permanent pasture or standard grade should be used, and the amounts given are based on an 80 per cent. minimum germination. Good seconds or seed bought subject to germination test direct "off the mill" will give good results at less cost, provided the grasses are of Certified type.

Poa trivialis does well on the more fertile moist flats, particularly in combination with strawberry clover, under conditions where the water-table rises in the winter and water may be on the land for a considerable time. Under these conditions ryegrass and white clover tend to die out, but *Poa trivialis* and strawberry clover, because they will stand being under water for perhaps weeks at a time, will survive and produce good grazing in competition with the rushes and sedges which tend to occupy land under these conditions.

Late Sowing

Occasionally weather conditions, especially in the spring, preclude the sowing of the grass until after mid-October. In this case the sowing of sweet yellow lupins at $1\frac{1}{2}$ bushels to

the acre will make an ideal preparation for autumn sowing, providing at the same time an abundance of good feed for both cows and sheep and a much higher nitrate level to the soil.

After the crop has been grazed out all that is needed in preparation for the grass is a severe discing and harrowing to level out inequalities in the soil. This should be followed by rolling and sowing. The land should not be rolled after sowing, as this induces wind erosion.

Stocking

For the first grazing after the establishment of the pasture sheep are by far the best, but it is not always possible to employ them. If cattle are used it is most important to remove them if damage to the sward is noticeable, and then to roll immediately to bed down the grass firmly and to re-sow at once any patches which have been damaged.

Sheep will not pull out tufts of grass and the effect of their hooves will serve instead of the roller, but they should be concentrated in heavy numbers to enable the grass to be eaten down in two or three days. If sufficient sheep are not available to effect this over the whole area, it should be divided into breaks and fed off in succession.

Time of First Grazing

The time of grazing is important. As too much shade for long periods will inhibit the growth of clovers which are vital to the success of the sward, the first grazing should take place when the nurse crop is not more than 6 in. high and the stock should be left on the area until the nurse crop is shortened to about 2 in.

Thereafter rotational grazing should be practised to prevent the grass from becoming long and matted, which tends to thin out the pasture quickly and undo all the good work which has gone into establishment of the pasture.

Topdressing and Manuring

In most sand lands there is generally a considerable proportion of finely-ground sea shell which is rich in lime. Though on newly-consolidated sand country nearer the sea lime may not be necessary to the establishment of a good growth of clovers, on the older, more consolidated and leached sand country further inland lime applied at sowing down of pastures and as a topdressing has given good results, particularly where somewhat heavy applications of phosphate have been made. A dressing of up to 10cwt. at the time of sowing down and an occasional dressing of 5cwt. per acre of ground limestone should keep these soils sweet.

Serpentine superphosphate is recommended for sand lands, as it is not readily leached from the soil, and, because of the almost general presence of iron in some form, it gives better results than superphosphate.

Rate of Manuring

In the past, on older sands, fantastic amounts of phosphate have been applied—even up to 10 and 12cwt. yearly—under the mistaken impression that the spectacular results obtained from smaller dressings would naturally be increased by larger ones. This led to severe disturbance in the balance of plant food in the soil, with corresponding alteration in the type and quality of pasture, subsequent sudden and disastrous appearance of abnormal conditions in the growth of stock, and a sharp drop in production. After an initial dressing of 3cwt. of phosphate, 2cwt. yearly, in conjunction with the lime already recommended, is a sufficient dressing.

Potash. Potash is not a limiting factor on sand soils in the early stages, but after 10 years of efficient grazing there are indications that potash supplies are approaching a low level in comparison with other plant foods. Results of experiments under way to determine the effect of potash topdressing will be published as soon as available.

Trees

Wandering dunes, higher stabilised dunes, and dry ridges must first be planted in marram, lupins, or other plants, according to their nature. Even then, unless given constant attention, they will become broken by stock or gullied by wind where plants have died out. These areas, therefore, are more suitable for planting in conifers, which will not only fix them for ever, but will provide much-needed shelter for stock and pastures and, with judicious felling and replanting, will even provide useful timber.

Trees will not grow on unprotected sand because of the drying of the soil, the cutting action of blown sand, and the sheer force of sea winds. Sharply-ridged dunes, too, are not as suitable for tree planting as those which are naturally even in contour, such as the wandering or semi-wandering dunes, or dunes which have been artificially flattened.

Planting, therefore, is best done among tall marram or lupins on the hills or among tall grass, lupin, pampas, or toi toi on the moister flats where the provision of shelter is necessary.

The planting of trees is essential for the proper development of sand country, and in any plans for such work the provision of shelter must have an important place.

THE USE OF A GAS BOX FOR

By R. S. WALSH, *Apiary Instructor, Auckland.*

IN many parts of New Zealand seasonal conditions in early spring are unsuitable for rearing queen bees in time to provide a supply of young queens for use in honey-producing hives that year, and in early autumn the colonies include a large number of old field bees of no further use, which usually become very troublesome when the hives are opened for any purpose. This article describes a gas box method of disposing of the old queen and surplus bees readily during autumn requeening operations.

AUTUMN is generally conceded to be the best time to requeen bee colonies. If for no other reason than the difficulty experienced in obtaining young queens sufficiently early in the spring, autumn requeening is to be recommended. However, the introduction of queens at the end of the season is fraught with many minor difficulties, the most serious of which is robbing.

In the Auckland district bees continue to breed long after all sources of nectar have ceased to yield, and breeding may even increase during unseasonal periods where bush and manuka are within reach of the bees. If colonies are to winter well, they should be headed by vigorous



Fig. 1.



Fig. 2.

queens and be strong in young bees. As breeding is prolonged in hives in this district, the disposal of the old field bees at the end of the season is a decided advantage. Mr. W. E. Marsden, of Onehunga, a beekeeper of long experience under Auckland conditions, is fully aware of those problems and has devised a method by which colonies may be requeened without the necessity of finding the queen and, with the same operation, a large number of the old field bees may be disposed of.

Construction of Gas Box

The contrivance used, aptly named the gas box, consists of a full-depth and a half-depth super cleated together. The full-depth super is tin-lined to form a chute, at the bottom of which is a hole about 5in. square to allow the bees to fall into the bottom half super (Fig. 1). Between the two supers a freely-moving but neatly-fitting slide is so arranged that it can be used to close the hole at the bottom of the chute. The bottom of the half super is boarded over to form a container to hold the unwanted bees and queen; one of these boards should be removable so that the dead bees may be emptied out.

Such a gas box may be considered rather heavy and, if desired, a lighter wood may be used, provided the normal super measurements are retained. The super containing the chute need not be of full depth; three-quarter depth is sufficient. The main requirement is that both supers and the metal chute should be proof against the escape of either gas or bees.

AUTUMN REQUEENING OF HIVES



Fig. 3.

Method of Operating

More effective results are obtained if two persons work together, but that is not essential. Colonies should be reduced to two brood chambers before requeening is undertaken. Fig. 1 shows the equipment necessary for the operation.

The colony, including both brood chambers, should be lifted aside and placed on to a spare bottom board and an empty super placed on the original hive stand. The frames are then taken singly from the brood chambers and the adhering bees shaken into the empty super now occupying the former position of the hive. As the frames are shaken free of bees they are put into spare supers and covered (Fig. 2). This operation may also be performed by placing a complete super of brood and bees over the empty box. Immediately all the bees have been shaken into the empty super (the queen will be shaken with them) an excluder is put over it, the two supers of brood set above the excluder, and the mat and lid replaced (Fig. 3).

If a large apiary is to be requeened, 14 or 15 hives should be treated in that manner before the next operation is undertaken, allowing sufficient time for the number of bees necessary to take care of the brood to pass through the excluder. If only two or three hives are being treated, it will be necessary to wait about eight minutes before attempting the next step. Should the bees be too slow

in moving up through the excluder, a puff of smoke usually has the desired effect.

When the necessary number of hives has been prepared the second part of the manipulation is begun with the first hive. The two supers of brood are again lifted aside and the excluder removed. The bees in the empty super (which also contains the old queen) and those on the bottom board are then dumped into the gas box, which is stood directly behind the hive stand (Fig. 4). The slide between the two sections of the gas box must be fully withdrawn to allow the bees to fall into the container below.

A spoonful of calcium cyanide in powder form is dropped through the hole at the bottom of the chute to destroy the surplus bees and queen, and to confine the gas fumes and bees the slide is pushed home immediately the chemical is put in; a single application of gas is sufficient to dispose of the bees from about a dozen hives. The hive containing brood and bees is then set up on its original stand and a caged queen introduced.

Cells may be used successfully for requeening by this method, but an important precaution must be observed: Only half the apiary should be treated, as the drones are almost completely eliminated, and about a week must be allowed for those in the untreated portion of the apiary to become distributed throughout the hives.

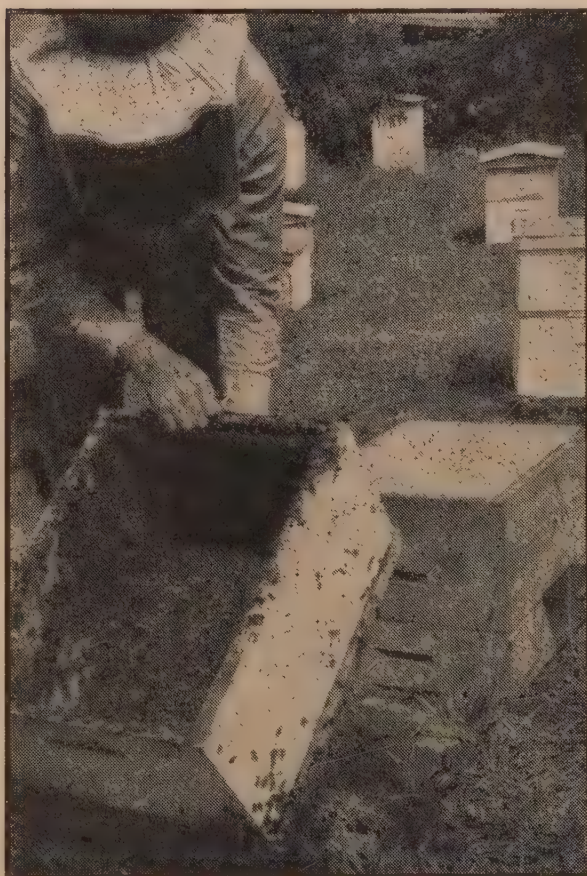


Fig. 4.



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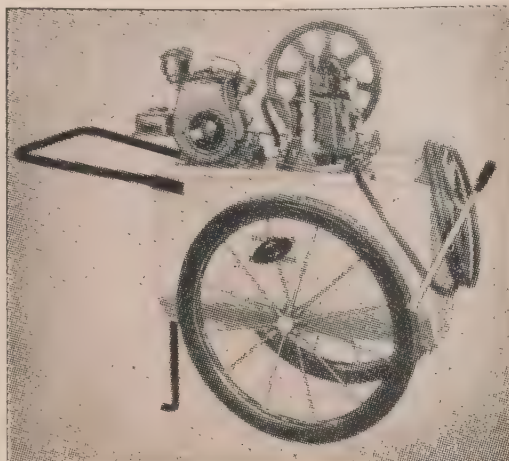


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Growing Tree Stocks for Shelter Planting

By M. SUTHERLAND, *Farm Forestry Officer, Rural Development Division, Wellington.*

MOST busy farmers regard it as an advantage that when they want to plant shelter they can send an order for young trees to a reliable nurseryman and receive them at the required time ready to be planted. To grow trees on the farm takes time, to buy in plants saves time, but it is sometimes more convenient to have the stock growing in the garden, whence it can be taken for planting out in spare moments. Many farmers are also good gardeners and for them raising trees on the farm is not difficult, though to grow stock for harvesting in, say, 40 years demands somewhat more care and skill than is required to raise seedlings for annual stock, where the results of mistakes are felt for only a few months.

THE chief advantages of growing trees on the farm are that there is no danger of plants being delayed in delivery from the nursery, which might cause injury to the trees by their drying out, and they are on the spot ready to be dealt with in odd periods. With simple arrangements made to grow his own shelter stock, the farmer is able to grow easily a small number of many different kinds of plants to meet varying needs on his farm and garden.

It is not possible to cover every aspect of tree raising under all conditions in New Zealand, as methods must vary with climate and soil conditions and with the requirements of different groups of plants. The information offered endeavours to cover the treatment of the most useful and common types of shelter species likely

to be required and, provided certain basic principles are observed, the growing of his own trees and shrubs should present no special difficulty to the farmer.

Site for Nursery

Unless he intends to grow a large number of plants for extensive operations, the farmer may use some suitable ground in his garden or orchard—an example is shown in the photograph at the head of this article. The soil should be fairly light and well drained, have a good humus content, and be easy to work even in winter. The aspect is important; a southerly exposure should be avoided, as should one which is open to the prevailing wind, and in the colder and frosty parts of the South Island it is necessary to choose an area which receives

The farmer's work is the production of crops and stock: The business of the nurseryman is to produce growing plants for the use of the man on the farm. To each man his trade, but under certain circumstances the farmer may be justified in adopting the function of the horticulturist by growing his own stock to plant on his land. This article, the second half of which will appear next month, discusses methods of raising trees and is intended as a guide to farmers who wish to raise their own stock for shelter planting, either because transport to their properties is difficult or because they have an urge to carry out for themselves every step in shelter or amenity planting on their holdings.

sunshine in winter so that the soil is thawed out during the day when trees have to be removed for planting. The usual shelter provided in the farm garden is sufficient for the raising of tree stock, but it is not advisable to use an area too shut in by hedges or tall trees, as lack of an air current tends to make trees too tender to endure the wind buffeting they will receive when planted out in the open, and still air is conducive to the development of diseases on the planting stock. It is best to choose a sheltered part for sowing seed and a less sheltered area for the nursery lines; it is good to

TREATMENT OF YOUNG SHELTER TREES



The cultivation of nursery lines with the hand hoe. The lines contain *Cupressus macrocarpa* seedlings which were grown in a farm nursery on sandy soil and are now lined out in a small nursery formed on the edge of sandhills and protected by the belt of young *Pinus radiata* in the background.



Specimens of some native shrubs often used to form shelter hedges. To produce larger, easily-handled plants for special purposes, these two-year-old plants were potted instead of being lined out in a nursery. They are *Pittosporum tenuifolium* (upper line), *Pittosporum crassifolium* or karo (centre), and *Dodonaea viscosa* (lower).

have also a shady corner somewhere in the garden earmarked for the growing of cuttings and more tender species.

A good plan is to use for a nursery plot an area on which a green crop has recently been grown. In growing planting stock, especially for shelter, care should be taken that the plants are never of forced growth, which tends to be too rapid and soft, plants becoming tender to frost and liable to disease. Therefore, manures should be used sparingly in nursery soil. The best way of supplementing the plant food is to dig in, some months before sowing seed, either well-rotted compost or farm manure or a green crop such as blue lupins. It is better to encourage the growth of seedlings for planting out by plenty of hoeing and cultivating of the nursery soil than to use artificial nitrogenous manures. A light application of superphosphate (about 1oz. to 3 square yards) or blood and bone manure, raked into the topsoil when it is being prepared for seed sowing, may be an advantage on poor, sandy soils.

Kinds of Trees

The types of trees and shrubs required for farm planting may be placed in three groups: Hedge plants, native trees or shrubs, and tall tree species, either broad-leaved or conifers. The propagation of hedge plants will be dealt with fully in a later article on hedge shelter.

Many kinds of shrubs, of both indigenous and exotic origin, are of special use in the formation of shelter as preliminary protective lines to high shelter planted in association with them, as a bottom filling to bare tree trunks, or in the formation of an exposed, graded, vegetative incline to deflect wind upward over tall shelter trees. Many such shrubs can be home grown without much difficulty, and when a quantity is required it may be economical to produce them on the farm from seed or cuttings collected from known specimens.

Among tall trees used primarily for high shelter on farms the most common conifer species are the quick-growing exotic pines (*Pinus radiata*, *P. muricata* and *P. murrayana*), Oregon pine (*Pseudotsuga taxifolia*), *Cupressus macrocarpa*, deodar cedar (*Cedrus deodara*), Japanese cedar (*Cryptomeria japonica*), and big tree (*Sequoia gigantea*), all of which are raised by similar nursery methods. Most of the native trees in use are broad-leaved species and require somewhat different treatment from the pines, and many of the exotic broad-leaved or deciduous trees used in farm and homestead planting are treated according to individual characteristics and can be grouped roughly for raising according to whether they produce large or small seeds. The seed characteristics of

trees are so varied that different treatments are required for each type of seed: For example, there is the seed which is borne in a dry fruit or a pod, such as that of the beech, plane, acacia, eucalyptus, pohutukawa, lacebark, and kowhai, while the majority of native trees bear seed which ripens within a berry (ngaio, karaka, and coprosma) or have a soft outer cover (puriri and miro). Some kinds of seed can be kept for a long time after they are ripe; others must be sown immediately or they lose their germinating capacity. Such factors must be studied by the plant propagator who wishes to collect his seed and grow his own plants.

Variations in Tree Form

If there is growing on the farm a tree which is particularly useful for a special purpose, it is wise to endeavour to perpetuate this type for future use by growing cuttings from it or by collecting seed and selecting new similar stock from among the seedlings produced. In the past much seed of *P. radiata* and *C. macrocarpa* has been collected and sold for tree propagation with very little supervision of the type of mother tree producing the cones, which in numerous cases was of poor type, resulting in the planting on farms of many trees which perpetuated the poor characteristics. A type of *P. radiata*, for instance, particularly noticeable in farm plantations throughout the Dominion is a short-boled, rough tree with spreading branches carrying heavy crops of cones, often with a forked and malformed stem and



The trees of this belt of *Cupressus macrocarpa* were of poor type, branching heavily from a low level, and when felled the butt timber required too much labour to split and was discarded. When growing *C. macrocarpa* for farm timber it is best to plant tree stock which may reasonably be expected to produce clean, even stems.

crown; such a tree will never produce either good timber or shelter, while occupying more than its share of land and soil. Therefore, seed should never be collected from such trees, though it is much more easily secured, but from mother trees which have tall, straight trunks, pyramidal crowns, and light side branches bearing sparse cones;

the seed from this type of tree produces a good proportion of like trees which grow rapidly and are of economic value for shelter and timber.

Cupressus macrocarpa shows similar diverse forms of tree growth. In this species the heavy limbs and parts of the bole of the rough type can be split into posts, but there is usually a large proportion of waste timber in the base of such a tree, as too much labour is required to split it and so it is discarded. Also, the spreading branches overshadow and influence the pastures over too wide an area, and its shelter value is reduced by the open limbs.

A variation in the form of trees is shown also in Lawson's cypress and other cypress species used for shelter. All gradations from narrow, stiff, vertically-branched trees to spreading and drooping forms are often apparent in one belt. For shelter planting, therefore, seed should be gathered only from a spreading form which is most suited to the purpose.

By indiscriminate planting of any type of tree the farmer is often perpetuating the least desirable form for his purpose. He will improve the quality and efficiency of his shelter woods if he selects his tree stocks as he would seed for his farm crops, as the results from bad planting stock are more far reaching than with annual crops. Scattered about the country are stands or single trees of proved good utility-type trees, and anyone wishing to raise his own stock would do well to approach owners for permission to collect cones or seed.



[Green and Hahn Ltd. photo.]

This belt of *Pinus radiata* in Canterbury is of good type trees with straight, tapering stems and light side branches. They will produce good farm timber.

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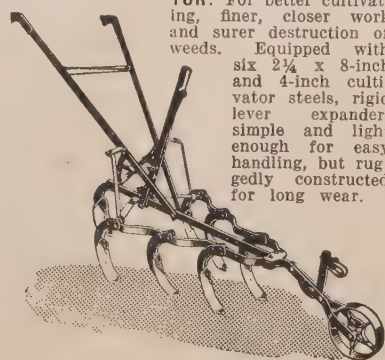
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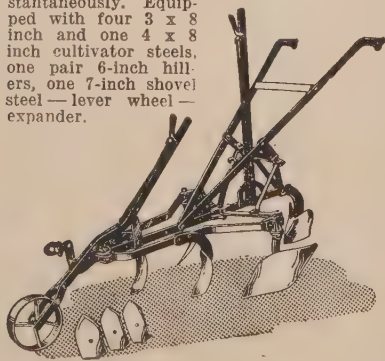
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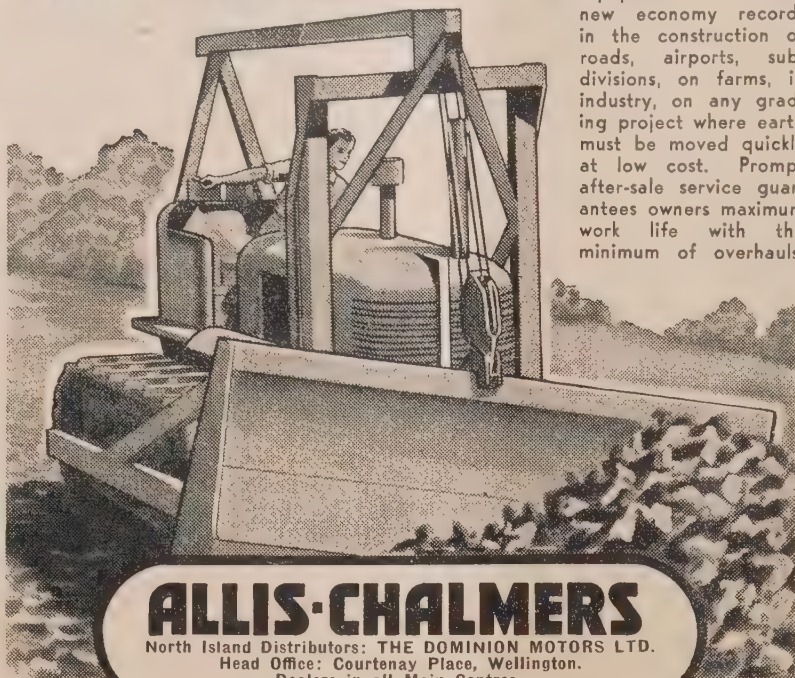
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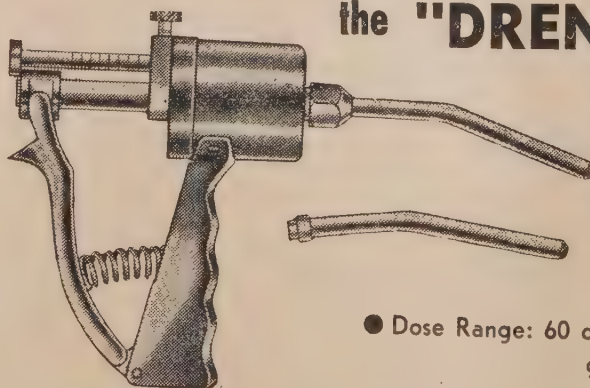
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CONES AND SEEDS OF TREES USED FOR SHELTER PLANTING

Assuming that the farmer is collecting seed from his own trees, the most important point is to collect seed when it is in the best condition. Most seeds should be taken when fully ripe and when about to fall naturally from the tree. Many species of the pea family, such as wattles or tree lucerne, open their pods as soon as the seeds mature between November and February and the seed falls to the ground; it should be secured before it drops, but pods should not be collected while still soft and green. For seed in capsules (for example, pohutukawa) the fruit should be collected after it turns from green to brown but before it opens.

An indication of the maturity of berry fruits is given by the colour and condition of the pulp, and there need be no special hurry to gather these unless birds compete for them, as, even if they fall to the ground, the seed is protected and will not rot. Some seeds such as karo (*Pittosporum crassifolium*), and others of this genus which are coated with a sticky cover and are attractive to birds, germinate best when collected before most of the fruits open on the tree and should be sown immediately.

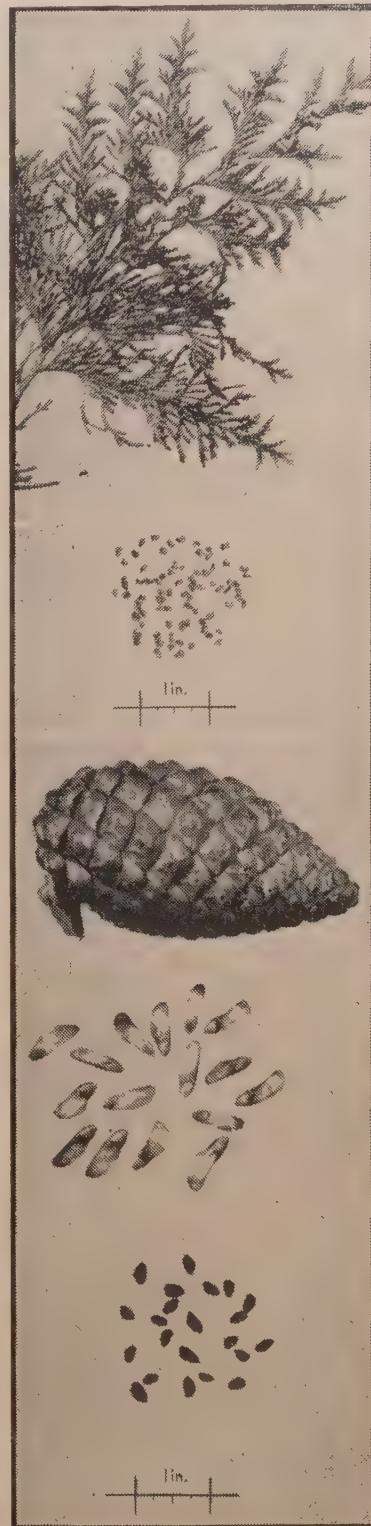
Seeds of most of the broad-leaved trees (for example, silver birch) should be collected as soon as they ripen, usually in autumn. Elm is an early seeder and drops its seed before Christmas. The nuts of such trees as oaks, beeches, and chestnut fall when they ripen and may be collected easily from the ground.

Seed must be collected from standing trees either by climbing or by shooting down branches bearing fruits or cones. Seed of cone-bearing trees is easily gathered during felling operations. Seed of such berry-bearing hedge plants as the coprosmas—of which taupata (*C. Baueri*) is one—ngaio, and mahoe, which are best propagated from seed, ripens early in autumn and must be obtained then; these species are best either sown immediately in boxes or stored in damp, sandy soil until the spring.

Before seed is collected from coniferous trees the best-type trees should be selected and care should be taken that cones are gathered from the portion of the crown which has been exposed to maximum sunlight during development. Only recently-matured, well-shaped cones should be collected, as experiment has indicated that seed from old cones—the grey, dry ones at the base of the branch—of species such as *P. radiata* or *P. muricata* which retain their cones on the tree for many years has less vitality than that from cones matured in the preceding three or four years. Green cones should never be collected for seed. The sea-

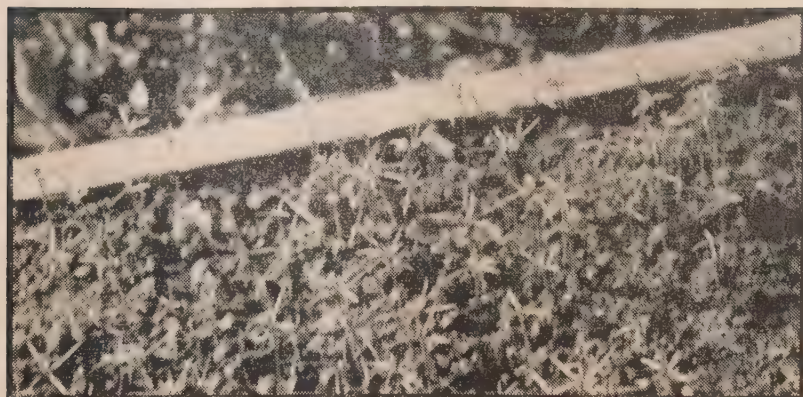


Upper — *Cupressus macrocarpa*.
Lower—*Pinus muricata*.



Upper—Lawson's cypress. Lower—*Pinus radiata*.

SOWING SEED FOR SHELTER TREES



Seed of *Cupressus macrocarpa* sown at the rate of 2oz. of seed to the square foot produced these month-old seedlings.

son for the collection of seed of hard-coned species is immaterial, but with such trees as Oregon pine, some cypresses, cryptomeria, or redwood it is necessary to watch the progress of ripening and collect cones in the early autumn, as they open from January onward and the winged seed is dispersed by wind.

Seed Extraction

Seed falls naturally from dry capsules during storage, and it may be desirable only to clean the seed sample by shaking it through a suitably-meshed sieve. Some seed, such as that of pohutukawa or manuka, is very small and light and is usually mixed with pieces of capsule which are impossible to separate by the rough means available to the layman.

Seed in berries is best separated by rubbing the dried berries between the fingers, or for larger quantities by mixing them with damp sand and rubbing the mixture over a sieve. This treatment is also used for sticky fruits such as *Pittosporum*. When the sticky mass of seeds is removed and rubbed in damp sand the seeds become separated and dry and are then easily sown.

Coniferous seed is extracted from the hard, closed cone of *Pinus radiata* or *Cupressus macrocarpa* by warming the cone until it opens; that is done naturally by spreading cones on the ground in hot sunshine, or can be hastened by using artificial heat. A small quantity of seed can be obtained by putting cones into a cooling kitchen oven where temperature does not exceed 110 degrees F. for three or four hours and repeating the heating periods until the scales open, but care must be taken that there is sufficient ventilation by leaving the door ajar to prevent the "cooking" of the cones or the vitality of the seed may be destroyed.

Seed of *macrocarpa* extracted from cones is usually clean and ready to

store or sow, but pine seed has a fine papery wing. To detach this the seed can either be shaken about in a rough bag or the wing may be rubbed off by working over the seed with the hand; in large quantities the seed may be lightly sprinkled with water and left in sunshine, and on drying the wing contracts and falls off and seed may be separated by sieving or winnowing.

Sowing Seed

To raise a small number of plants for farm purposes seed of shelter trees or shrubs may be sown in ordinary seed-boxes. For tree seedlings the boxes should be not less than 5in. deep so that a taproot may have room to grow straight down. Another way to grow larger numbers, especially of *P. radiata* or *Cupressus macrocarpa*, is to sow seed directly into lines in the nursery plot.

Having prepared the seed-boxes with a thin bottom layer of fine shingle or gravel covered by 2in. of well-rotted compost and finished with about 1in. of sandy loam, firmly pressed down and uniformly even, the box may be bottom watered and left to surface dry. Seed may be sown broadcast or in drills. If it is to be in drills, the surface must be marked off into drills about ½in. wide and 2in. apart, with the depressions ½in. or ¾in. deep according to the size of the seed.

If seedlings are to be removed and pricked out later, drill sowing has the advantages that seedlings are more easily removed without damage and the soil is easily kept stirred between drills. If seeds are sown broadcast and at sufficient spacing, each seedling has more room to develop but it is more difficult to keep the soil stirred by pricking the surface between seedlings.

The density of sowing must vary with the kind of seed and its germinative capacity; 1oz. of *P. radiata* seed gives between 600 and 700 trees

and 1oz. of *C. macrocarpa* seed about 460 trees. The depth of covering soil differs with the size of the seed. Seeds like those of *P. radiata* germinate best if covered by ½in. of sand or soil, larger pine seeds require ¾in., and acorns, chestnuts, and large seeds should be planted at least 1in. deep. The small seed of *C. macrocarpa* or Lawson's cypress germinates best with a covering of less than ½in., and very fine seed such as pohutukawa, manuka, eucalyptus, and silver birch should be sown broadcast on the soil surface, mixed with dry sand for easier sowing, and covered with only a thin film of sand, or merely rolled in.

Seed may be sown dry, but germination is hastened if it is soaked in water for a night before being sown, then surface dried or mixed with dry sand for easy sowing. With some hard seeds, such as those of wattle, tree lucerne, or kowhai, it is better to pour hot water over them and leave them to cool and soak for 12 hours before sowing.

When seed-boxes have been sown and the seed covered with sand or fine soil, the surface should be lightly pressed with a flat board and the box then partly sunk in the ground in a sheltered spot or placed in a cold frame. Any glass covering used should be removed as soon as the seed caps break through the surface, as conditions under glass "draw up" the seedlings, making them spindly and weak, and also encourage "damping off" disease.

When through the soil the seedlings must be shaded from hot sunshine and protected from birds. That can be done by placing short manuka, cypress branches, or bracken in the ground on either side of the box and bending them over it. A cover of hessian is not the best thing to use, as it is too heavy a shade for most species and excludes much air. Seed-boxes should be kept moist by shading and occasional watering and seedlings will begin to show in two or three weeks, according to the species and weather. Shade protection should be gradually removed after seedlings are about 1 to 1½in. high or they may become drawn up and weak. In frost areas of the south it may be necessary to replace the branch protection in late autumn to protect against early frosts.

Line Sowing

Some farmers may find sowing tree seeds directly into the nursery plot in lines or bands less trouble, and for large-scale sowing this work is done quite often with a small mechanical seeder. In the farm garden the plot should be prepared by removing stones and hard lumps of soil and cultivating to a fine tilth. It is then firmed by light rolling or by pressing down with a heavy plank along the lines to be sown. A line is stretched

TREATMENT OF SEEDLING TREES



Pinus radiata seed can be sown directly in nursery lines and, though the crop is often uneven, the seedling lines can be weeded very easily and cultivation of the young trees is easier than when they are grown from seed broadcast in a bed. These seedlings are nine months old.

and shallow drills are marked out 12 to 15 in. apart by pressing back the soil along the line with the back of a rake, making a drill $\frac{1}{2}$ in. deep. The seed is then sown thinly along the drill. For pines and cypresses the aim should be a tree every 2 or 3 in., and these can then remain in lines and be planted out directly from there. Sand is used to cover the drills to a depth of about $\frac{1}{2}$ in. or the soil is lightly raked back and the drills firmed by patting them down lightly with a spade. Only the hardy pines or macrocarpa should be line sown.

In most places line-sown seed is vulnerable to mice and birds, and as a preventive the seed may be moist-

ened and shaken up with powdered red lead, which acts as a repellent while it lies in the ground. If lines are short and can be covered by branches or wire netting, this poisoning may not be necessary.

Season for Sowing

Seed of most species used for shelter is best sown in the spring after it is collected, but some of the berry type of seed germinate better if sown immediately the seed leaves the tree; for example, karo sown in February will line out in three months and be ready for planting in little longer than seven months. Some species such as taupata are best sown in the ground in autumn and allowed to lie over the winter,

shooting up early in the spring. If alder plants are required for river bank protection it is more satisfactory to sow the seed by scattering the fruits on a damp spot in the vicinity immediately the fruits open about May, and when many seedlings result they may be thinned out and used immediately for planting wherever required.

Pohutukawa seed loses its viability soon after ripening and should be sown in boxes in July or August for a good strike. The seed of kowhai germinates in moist conditions and warm weather as soon as it falls to the ground in January.

The usual time for sowing tree seeds is October and November. If earlier weather is unsuitable, the work can be postponed to the first half of December in southern localities.

Weeds which spring up among the trees after they are well above ground should be picked out by hand. Between bed drills weeding is done with a small hand fork, and between seed lines it is possible to use a hand hoe. In broadcast beds or boxes the only cultivating possible is by pricking the surface with a narrow two-pronged fork or pricker.

A method of reducing weed growth is to place some old, fairly open-meshed sacking on the surface of the soil, sprinkle a very thin layer of fine soil on it, and water it thoroughly. The seed is sown on this and covered at first by a sack. When the seed germinates the roots push down through the mesh, but weeds growing up on the surface of the soil below do not penetrate the sacking and thus the first weeding is avoided.



A box of seven-month-old *Pittosporum crassifolium* seedlings. Seed was sown too thickly and seedlings require to be pricked out without delay to prevent their growing too tall and weak and to give the roots room to develop.

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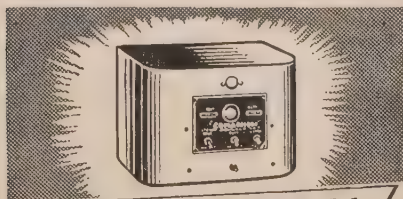
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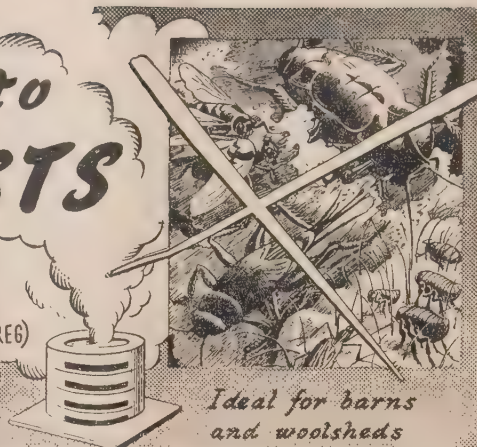
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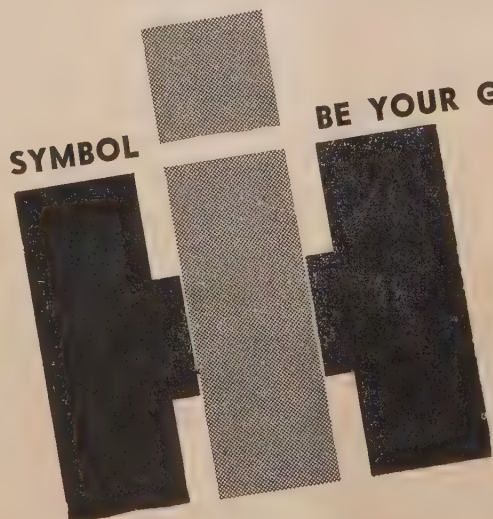
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THE HOME GARDEN IN MARCH

By A. G. KENNELLY, *Instructor in Vegetable Culture, Christchurch.*

THOUGH the amount of work urgently requiring attention is usually less in March than in preceding months, the keen home gardener will find plenty to do. In the well-planned garden peas and beans, green vegetables and salad crops, root crops, cucurbits, and tomatoes will require harvesting. Though sowing and planting are relatively less important than earlier in the season, there are a number of items which should not be overlooked.

CABBAGE, cauliflower, silver beet, and lettuce for spring use can be sown in most districts; carrots can be sown in central and northern districts. Turnips, spinach, and onions can be sown. Shallots and onions can be harvested and stored, also main crop potatoes where they are mature. Earlier-sown crops such as spinach, silver beet, and lettuce can be thinned or seedlings planted out. Hoeing, weeding, and watering where necessary should be attended to. The spraying of brassicas and celery and of potatoes and tomatoes in most northern districts should not be overlooked. Any area not immediately required for cropping should be forked over and sown with a cover crop and the compost heap should be built up with garden refuse which does not bear the spores of long-lived disease.

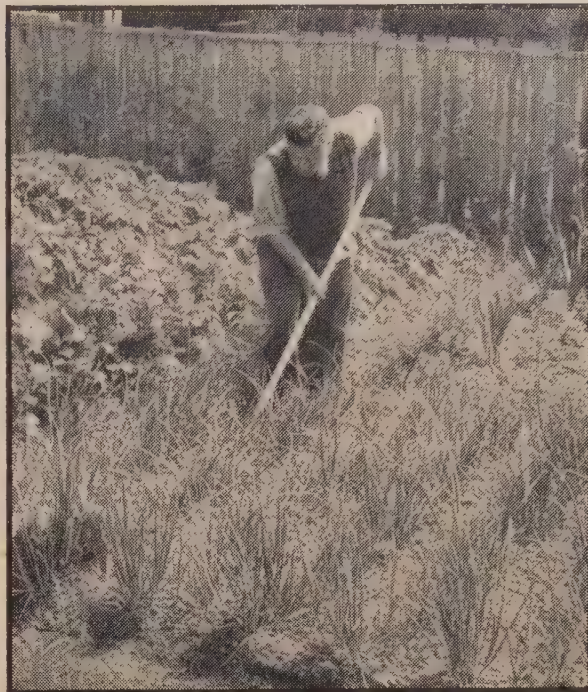
Carrots

Except in Canterbury and districts to the south, where autumn sowing is rarely advisable, home gardeners desiring early spring carrots should make a sowing before the end of March. Where winter conditions are relatively mild, later sowing is in order, but the aim in most districts should be to have the young plants well enough established to prevent their being lifted by frost but not so large that severe winter weather will so check them



[Green and Hahn Ltd. photo.]

Even if full development of the roots is unlikely, a sowing of turnip seed at this time will provide a good crop of tops for use as greens; they are tasty and very rich in vitamins.



[Green and Hahn Ltd. photo.]

that they run to seed with the advent of the better weather of spring.

To ensure that germination is good the seed-bed should be well drained and worked down to a fine tilth. Where drainage is poor it is advisable to make a raised bed. For convenience in cultivating and harvesting the bed should not be more than 3ft. wide. Soil heavily manured for a previous crop is excellent and sandy or light loams are especially suitable for autumn crops. Superphosphate at the rate of 2oz. a square yard is recommended for most soils, and if dry wood ashes are available they can be broadcast over the soil and raked in before sowing the seed. Seed should be sown thinly $\frac{1}{4}$ to $\frac{1}{2}$ in. deep, according to whether the soil is heavy or light, in rows 12in. apart. If the soil is light and free, there should be no need to thin, but on heavier soil the young plants can be thinned to 3in. apart. If thinning is delayed, the thinnings may be used for soups and stews. Quarter of an ounce of seed will sow about 100ft. of row.

Good varieties of carrot for autumn sowing are Chantenay, Early Crop, and Market Garden. In shallow or heavy soils a variety such as Early Horn will be found suitable.

Onions and Shallots

In most gardens shallots will now have been harvested, but the harvesting of onions is still likely to be a number one priority. Both the onion and the shallot are in popular demand throughout the year, and harvesting and storing should be done with care to reduce to a minimum loss during storage. Onions should be kept free from weeds right up to harvesting. If the weather is wet, weeds are difficult to control. They must be removed from the rows by hand, as most grow vigorously and tend to interfere with drying. Harvesting can commence when the bulbs are firm with thin, dead and wiry roots and most of the tops are withered and tend to fall over naturally, but ripening

THE HOME GARDEN IN MARCH . . .

is often uneven and onions that continue to grow strongly should be encouraged to ripen by bending the tops. It is usual to bend the tops of two adjoining rows toward each other. Though the commercial grower usually wheel hoes his onions from the bed, in the home garden onions can be pulled by hand; if they have a firm hold when it is necessary to commence harvesting, the root can be cut with a sharp hoe. After lifting, the onions are laid on their sides to dry. It is usually advisable to turn them several times so that they ripen evenly. Immature, split, thick-necked, or diseased specimens should be put apart from the onions which are to be stored. Onions can stand some frost. Ventilation and protection from rain and excessive moisture are the most important factors in harvesting and storage, and the structure described in last month's "Journal" is recommended where drying is difficult.

Seed Sowing: In most districts late March or early April is considered the best time for the autumn sowing of onions. In central and southern parts of the South Island onions are not thinned, but are kept cultivated and grown on until about the following November or December, when they are used as "thick necks" without being encouraged to form large bulbs. Autumn sowing is often rather precarious and success depends to some extent on the season. Early frost will sometimes "lift" and damage late-sown crops, whereas if the seed is sown too early and growth is good, the plants sometimes run to seed before they have developed adequately.

Though this is true of autumn sowing in general, in the north, where the winters are not so severe, the risks are much less and autumn sowing and transplanting of the main crop in early spring are fairly general. For autumn sowing the ground should be deeply cultivated and broken down to a fine tilth. If well-rotted stable or farmyard manure is available, it should be incorporated some time before final preparation of the soil is commenced. The best use can usually be made of it by applying it to land on which the crop is to mature. Most soils will benefit from the application of 2oz. of superphosphate to the square yard before sowing, but if onions are to be matured where they are sown, bone-dust at the rate of 3oz. a square yard should also be applied; potash at the rate of 1oz. to the square yard or alternatively a good dressing of unleached wood ashes can also with advantage be worked into the soil.

Sow the seed $\frac{1}{2}$ in. deep in rows 12in. apart. Half an ounce of seed will sow about 100ft. of row.

Cauliflowers

Most crops will now be approaching maturity. Cauliflowers should not be

checked at any stage of growth, and it is therefore advisable to keep them adequately watered; if the soil appears to be lacking in plant food, regular watering with organic liquid manure will assist growth. Liquid manure can be made by soaking half a sugarbag of farmyard or stable manure in a large container of water—a 40-gallon drum is suitable—for about a week. The resulting solution can be used at the rate of about 1 part to 3 parts of water. If the container is then refilled with fresh water, the solution may be used at the end of a week diluted with equal parts of water. Thereafter each refilling should be allowed to stand about a week and the liquid used neat. The manure can be applied weekly at the rate of 4 gallons to about 18ft. of row. It is safe to use for all green crops and is a complete plant food. Gardens where organic manure is in short supply will especially benefit from its use. Dry soil is best watered before the liquid manure is applied. The bag containing the manure should be pressed from time to time to ensure more complete dilution of organic material in the water.

It is often advisable to protect the developing curd of a cauliflower either by tying in the surrounding leaves or by breaking a leaf or two so that the curd is covered and so protected from the weather. Sunlight sometimes causes discoloration of the curd and heavy or even moderate frost will quickly spoil it. Where frost may soon be expected the advantage of growing a self-protecting or semi-protecting variety will be obvious. Protecting varieties have strong leaves which curve over and enclose or partly enclose the curd and protect it from bluish.

Seed Sowing: Cauliflower seed can now be sown for early spring crops. Where winters are severe it is best sown in a cold frame or cool open glasshouse. The cauliflower is a comparatively delicate plant and if it receives a check it is likely to "button" (that is, to develop only a miniature curd). In most southern districts therefore seed sowing can be delayed so that the period between sowing and setting out is kept to the minimum, which enables the young plants to become large enough for setting out in the field but does not necessitate their being held in the seed-bed to run the risk of suffering a check. Where necessary spraying should be carried out as advised for winter greens.

Good varieties for sowing now are All Seasons and Walcheren.

Kumara

Apart from lifting the vines at intervals during the season to prevent their rooting at the nodes, very little

attention is usually required by kumaras once they are established. Lifting can be done with the handle of a rake; if it is neglected the plants will run to vines instead of roots.

Occasionally in dry weather the foliage is attacked by insects. For leaf-eating insects arsenate of lead at the rate of 1½oz. to 4 gallons of water should be applied and for aphids ("green fly") nicotine sulphate at the rate of 1oz. to 4 gallons of water plus 2oz. of soap will give protection. The digging of kumaras should be delayed as long as possible so that the tubers attain maximum size. Location will govern the actual time, but it must be completed before there is any frost, otherwise the tubers immediately under the crown are liable to injury. If an unusually early frost kills the tops, it is usually advisable to remove them promptly, as rots developing in the foliage sometimes penetrate to the tubers. With the foliage removed digging should be completed as soon as possible. When digging, the vines should first be cut off near the crown. Care should be taken not to injure the tubers, as if they are even slightly damaged they will not keep and should be put aside for immediate use. Careless digging and storage before they are properly dried are the reasons for a great deal of loss among kumaras. A broad-tined fork is best for digging; the tubers should be gathered into small heaps and left to dry for several days. They should be covered at night with the vines or with sacking. At the end of this period damaged tubers which may have been overlooked will have begun to decay and can be thrown aside.

Sound tubers can be stored in a pit in a similar way to potatoes.

Lettuce

Though strains have been developed for hot, dry conditions, most varieties of lettuce require moderately cool weather to produce firm, compact heads. Lettuce can be sown or set out during March, but where winters are severe it is advisable to sow seed in a frame or in a warm, sheltered situation so that the plants will be fairly well grown before frost or cold weather slows growth. It is usual to transplant from autumn sowing; the ground should be well drained and deeply cultivated and the soil very rich in organic matter. Well-rotted stable or farmyard manure, compost, or a green crop should be dug in some time before planting, and unless the organic matter in the soil is particularly rich, it is usually advisable in addition to apply a quick-acting fertiliser such as blood and bone manure at the rate of ½lb. to the square yard broadcast after digging and before planting. This can be supplemented, if growth appears slow after the plants have commenced to heart, by weekly applications of liquid

animal or fowl manure, or nitrate of soda can be hoed in along the rows—but not so as to touch the foliage—at the rate of 1oz. to the square yard. Lettuce must be grown quickly if good-quality produce is desired. During late autumn and winter this is something of a problem in most home gardens, and despite heavy manuring the slow growth usually makes it necessary to harvest the lettuce when quite small.

Though cos or romaine lettuce is not commonly grown in New Zealand, it is well worth a trial, as its flavour is considered by many to be the best of all types. In most districts it does well from an early autumn sowing. The cos is distinguished by its upright habit of growth, elongated head, and its stiff leaves, which, though somewhat coarse, are usually sweeter than those of other kinds. Self-folding varieties now available make the tying together of the leaves, which was a feature of the culture of the older variation, unnecessary unless the weather is very dry, when the difficulty can usually be overcome by slipping a rubber band over the outer leaves.

Varieties for Autumn Sowing: Neapolitan, Winter Market, Imperial 615. Cos. Cos Improved, Cos White.

Parsley

If an autumn sowing of parsley has not yet been made, seed can be sown now. Parsley is hardy and will stand the winter without harm anywhere in New Zealand. It is a biennial, that is, it goes to seed the second year; it is usually rather slow to germinate and grow, but it responds well to good soil and to an abundance of nitrogen. Blood and bone at the rate of 2 to 3oz. to the square yard is a satisfactory fertiliser on most soils. In most districts seed should be sown early enough to enable the young plants to become well established before the advent of cold weather. Provision is often made for slow germination by sowing a month or even six weeks earlier than would otherwise be the case, but in well-drained, moist soil germination delay is usually much reduced. Seed sown now is intended in most districts to provide supplies for next spring and summer, for in the well-planned garden parsley should be sown twice a year, in spring and autumn.

Seed can be sown in rows or broadcast on a small plot, but for best results the plants should be set out about a foot apart when at the seedling stage. They make quite a good edging and do well in a cool, moist soil in the open or semi-shade. Aphid is occasionally troublesome, but is easily controlled by spraying nicotine sulphate 1:800 ($\frac{1}{2}$ fl. oz. plus 1oz. soap to 2 gal. water).

Varieties: Moss Curled is most popular, but a variety known as Hamburg,



[Sparrow Industrial Pictures Ltd. photo.]
Lettuce can be sown or set out during March; the soil should be well drained and deeply cultivated and very rich in organic matter.

which has an edible root somewhat resembling a slender parsnip in shape and colour, is gaining in popularity. The flesh is white and rather dry and in flavour somewhat like celeriac. The roots are useful for flavouring soups and stews and can be stored in sand for winter use; the foliage is not of such fine quality as the Moss Curled. The rooted variety is best sown in spring.

Potatoes

Potatoes are mature when the skin of the tuber is firm and will not rub off easily, but while top growth is healthy and vigorous, tuber development will continue. The tops therefore give the first indication of crop maturity and should be watched closely, as there is rarely any advantage in leaving the crop undug once that stage has been reached. If the weather becomes wet and warm conditions prevail, second growth may occur and the tubers may develop knobby outgrowths, or small useless tubers may grow at the expense of the large ones. Insect damage is also common. In the north particularly the potato tuber moth may lay eggs on tubers not properly moulded. Slug damage is not uncommon in New Zealand, particularly when the autumn is wet; grass-grubs and wireworms too are occasionally troublesome. Loss from insect damage may therefore be considerable. Growing tubers that are attacked by insects occasionally endeavour to grow round the point of attack or source of irritation and the

knobbly outgrowths produced (not unlike those resulting from "second growth") make such tubers very wasteful in preparation for the table. In districts where crops are likely to be subject to an attack of late blight they should be sprayed with Bordeaux or suitable Government certified copper substitute, unless digging is to be commenced without delay.

Pumpkins and Marrows

Weekly applications of liquid manure made from organic material such as farmyard manure will be advantageous unless the soil is especially rich. As long as the soil is not permitted to dry out, pumpkins and marrows usually require very little attention at this time of the year. Once the plants are properly established and good laterals are developing, it should not be necessary to pinch back or stop the leading growths unless they are invading a neighbour's garden or ground reserved for another crop. Shoots can be trained in the desired directions by driving short sticks on either side of the stems at intervals of 1 to 2ft. If growing conditions are good and if the surface soil is kept moist and is well drained, the trailers sometimes root in the soil. This is a desirable feature, for it increases the weight of crop; pegging encourages it and also prevents trailers from being blown about and damage to the crop by strong winds. The fruit of marrows should be cut when young, preferably before the skin hardens so that it cannot be broken easily by the

THE HOME GARDEN IN MARCH . . .

thumb-nail. Ten to 12in. is a good size; the bigger marrows become the less flavour they have and the greater becomes the relative volume devoted to seed.

In favourable seasons too the more fruit is cut the more will develop and it is therefore inadvisable to allow fruit to reach full maturity unless it is intended to grow mammoth specimens or to store fruit for the winter. They store quite well and, like pumpkins and squashes, which should also be allowed to mature fully if they are to be stored, should be harvested carefully without being subjected to even slight frosts and stored under perfectly dry, frost-free conditions.

Pumpkins and marrows often become infested with aphids or "green fly." In warm weather the aphids multiply enormously and unless checked they soon cover the plant. Some species of aphids exude a sticky substance on which a sooty mould grows which renders the plant unsightly. Aphids also cause the leaves to curl and become distorted; the fruit and flowers too may become deformed. They frequently transmit virus diseases which may cause serious reduction in yield and in some cases even the death of the plant. Aphids are easily controlled by spraying with nicotine sulphate at the rate of 1 fl. oz. to 4 gallons of water. To this 2oz. of soap should be added to activate the nicotine. The spray should be applied on a still and preferably warm day and complete coverage should be aimed at.

Silver Beet or Swiss Chard (Seakale Beet)

Silver beet is a very useful, quick-maturing crop which grows well in the cool conditions of autumn. Grown under favourable conditions the crop yields very heavily. In southern districts February is preferred for sowing for spring use, but early March sowing is usually satisfactory if the young plants are enabled to become well established before the onset of cold weather. Seed should be sown as described in last month's "Journal." Good varieties are Giant Lucullus and Giant Broad White Rib (Fordhook).

Spinach, Spinach Beet

It is only of comparatively recent years that the nature of spinach and spinach beet has been fully appreciated. They are rich in vitamins and occupy relatively little space. Spinach is usually referred to as "round" or "prickly." This refers to the seed, not the top growth. Prickly-seeded spinach should be chosen for sowing during cool weather. Seed can be sown on

fertile, well-drained, and well-cultivated soil at any time during the autumn or winter, provided the young seedlings are enabled to establish themselves before severe frost is experienced. If sown thinly, there should be no need to thin the plants in the rows.

Spinach beet does not differ greatly from ordinary spinach in appearance, but it has a very much more substantial root. It "stands" well and in a moist, well-drained soil it will continue to produce fleshy leaves which can be gathered for many months with little trouble to the housewife.

In most districts it is advisable to sow the seed early enough in the autumn either to allow the plants to develop before winter frosts slow growth or to become sufficiently established to be able to complete development as soon as growing conditions improve in spring.

Good varieties are:—**Spinach:** Giant Prickly. **Spinach Beet:** Perpetual Green Leaved, and Spinach Beet.

Turnips

In good growing conditions turnips mature according to variety in from about 45 to 70 days. They grow well under cool conditions if soil drainage and fertility are good, but growth usually ceases with the onset of the frosts of late autumn or early winter. In districts where conditions are likely to remain favourable long enough to enable good "bulbs" or roots to develop, successional sowings can still be made. Even where full development of the root is unlikely it is a good plan to make a sowing for the purpose of using the tops as greens; they are tasty and very rich in vitamins. White varieties are usually chosen for the purpose.

At this season of the year light, well-drained loams are preferred.



[Green and Hahn Ltd. photo.]
In the well-planned garden parsley should be sown twice a year. An autumn sowing now should provide supplies for next spring and summer.

Turnips belong to the brassica family and should not therefore follow cabbage or cauliflower. They do well on land that was dressed with organic manure for the previous crop and they should be grown quickly. On land that is being used for vegetable production superphosphate at the rate of 1 to 2oz. a square yard is usually sufficient fertiliser. Sow the seed $\frac{1}{2}$ in. deep in finely-cultivated soil in rows 12 to 15in. apart and, unless the crop is being grown for tops, thin 3 to 4in. apart in the rows.

Good varieties are:—**White:** Early White Milan, Milan Purple Top. **Yellow:** Golden Ball (Orange Jelly). This is a particularly fine turnip and stands winter conditions well. If sufficiently developed before the onset of winter frosts, it can be left in the ground to provide fresh roots throughout the winter.

Winter Greens

Crops such as cabbage, cauliflower, and leeks should be kept cultivated and weed free. Diamond-backed moth and white butterfly can be controlled by dusts containing derris (rotenone) or D.D.T., but where aphids are present nicotine sulphate 1:600 (1 fl. oz. to 4 gals. of water plus 2oz. of soap) should be used. Alternatively a combined spray made up of nicotine sulphate 1 fl. oz. and arsenate of lead $1\frac{1}{2}$ oz. plus 2oz. of soap to 4 gals. of water can be used to control all three pests. In some districts downy mildew is troublesome, particularly in the seed-beds. Affected brassicas should be sprayed regularly with Bordeaux 3:4:50. Where both mildew and the above insect pests are present the Bordeaux can be combined with the arsenate and nicotine, but as the lime in the Bordeaux serves to activate the nicotine, no soap is necessary. Soap combined with Bordeaux is harmful to some crops.

Home gardeners are sometimes at a loss to know how to distinguish between the diamond-backed moth caterpillar and the caterpillar of the white butterfly. The white butterfly caterpillar is dull green, velvety in appearance, and up to $1\frac{1}{2}$ in. when full grown; a thin yellow stripe runs down the middle of the back, also a thin broken yellow stripe along each side of the body. The egg is yellow, bullet shaped, much longer than broad, and is attached at right angles to the leaf surface. It is just large enough to be plainly visible to the naked eye.

The diamond-backed moth caterpillar is green to bluish green and rarely more than $\frac{1}{2}$ in. when fully grown. The egg is flattened oval and light yellow. It is laid singly or in clusters, one partially overlapping the others, on the lower or upper surfaces of leaves or on leaf stems; it is similar in size to the hole made by the point of a pin.



THE CRUTCHING OF SHEEP

By J. H. HITCHCOCK, *Supervising Instructor,
Flock House Farm of Instruction.*

CRUTCHING is a seasonal activity on all sheep farms during the autumn. Though crutching does not involve the same amount of labour and planning as shearing, it is one of the major seasonal operations. The chief aim of crutching sheep is to keep the wool short around the crutch and backs of the legs so that it will be free from dags and dirt through the winter and spring.

CRUTCHING time falls naturally into the period of the year between shearing and lambing. No definite rule can be laid down as to when crutching should be started, as several factors influence it, chief among them being the date of lambing, the date of completion of the previous shearing and the type of grazing.

An analysis of these factors shows that breeding ewes should be crutched early enough for the in-lamb ewes to be handled with the minimum of risk, yet late enough to obtain the full benefit from the crutching. If ewes are crutched too soon after shearing, the wool will have grown to such an extent that it will be dirty at lambing, or shortly after, and the benefit of the crutching will be lost at the period when it is most important that the ewe is clean—at the birth of the lamb and during the initial

suckling period. Crutching is done early, and the value of the wool is perhaps a secondary consideration, when lambs or fattening sheep are to be grazed on rape and similar fodder crops; it is sound practice to crutch sheep before placing them on the crop.

Apart from the advantage of keeping the animal and the wool clean, crutching plays an important part in good sheep husbandry. It lessens the danger of fly strike, which is prevalent in some districts, and the muster for crutching enables other work to be done on the flock if necessary. On wet, low-lying country where foot-rot is prevalent the feet can be attended to when the animal is being crutched. In the South Island sheep are always eye clipped at crutching time; because of the breed of sheep kept in the South Island, eye clipping may be done as many as four times during the year. The North Island flockmaster has not the same worry with eye clipping, but where necessary this wool should be shorn off at crutching time so that sheep have adequate vision. Another advantage of the crutching muster, recognised as such by most sheep farmers, is the bringing together of the breeding ewes and rams at this period. Experience has shown that higher lambing percentages are obtained by doing this.

Two Main Styles

Sheep and lambs are usually crutched by one of two main styles. As with shearing, individual men develop

Heading photograph by Sparrow Industrial Pictures Ltd.

THE CRUTCHING OF SHEEP



1. CATCHING THE SHEEP



2. PULLING OUT THE SHEEP



3. COMMENCING POSITION, FIRST STYLE



4. FIRST BLOW AROUND THE CRUTCH

all sorts of short cuts and blows peculiar to their own methods, and the use of either style is a matter of choice. Both styles have their advocates and both have their advantages and disadvantages. A good crutcher should be able to do both styles, as some flockmasters prefer one to the other.

The descriptions of both styles which follow have been written for a man who wants to learn crutching. As with shearing, crutching can be learnt only by handling the sheep and handpiece, but these descriptions and illustrations will be of value to a learner.

Crutching is not always done as well as it might be and there is a greater tendency to "slum" crutching than shearing, perhaps because it is not considered as important, and because the monetary returns are not as great. More speed and less attention to detail sometimes mean a job not very well done.

However, good flockmasters will see that their flocks are well crutched, and it behoves every man who is learning to make his main objective thoroughness, not speed. As with shearing, speed will come automatically when the principles have been mastered.

Crutching is hard, dirty work compared with shearing, and in consequence is not popular with many shearers and if possible would be avoided, but often the position is that if they do not do the crutching, they will not get the sheep the following shearing season.

STYLE No. 1

Figs. 1 to 16 demonstrate the main holds and blows of the first method. Whatever method of crutching is adopted, however, the sheep are caught and dragged out on the board as shown. In the alternative method of bringing sheep out on to the board the crutcher stands directly behind the sheep, placing an arm around the sheep's neck, and pulls the animal up straight against his body. The sheep can then be walked out on its hind legs or dragged



out as shown in Fig. 2. The method shown in Fig. 1 is the better and easier method to adopt with in-lamb ewes. Keeping in mind all the time the need for careful handling, one hand is placed on the sheep's flank and one on its nose, the animal's head is given a quick turn, and at the same time a pull toward the crutcher will cause the sheep to fall against his legs. From there it can be picked up by the front legs and dragged out as shown.

The starting position for this style is shown in Fig. 3. It is important that the sheep should face away from the porthole as shown in Figs. 3, 4, and 5. If the starting position is correct, very little further movement of the sheep is necessary during the whole operation of crutching. Fig. 4 shows the beginning of the crutch. The first blow has been straight down the top of the leg from flank to toe, enabling the machine to enter the wool easily on beginning the crutch. If the sheep is in the correct position, it should be possible to start above the toes of the right hind leg and travel the machine right around the crutch to finish as shown in Fig. 5. The blow should clean out all wool immediately below the teats of ewes, but a narrow band of wool should be left on ewe lambs. If it is desired to remove all the wool below the teats of ewe lambs, the very small teats should be pulled back with two fingers of the left or free hand. A slight movement of the lamb, or a misjudgment of the crutcher, might cut off one or both of the teats unless this precaution is taken, and so ruin a future breeding dam. Many potential breeding ewes are lost through lack of care on this blow.

Two full blows around the crutch are generally sufficient to clean this area and Fig. 6 shows the beginning of the second blow. The next blows, those above the teats (Figs. 7 and 8), are most often slummed with breeding ewes only, yet they are the most important of all. Two full blows above the teats are the general practice, but



THE CRUTCHING OF SHEEP



7. THE BLOWS ABOVE THE TEATS



8 APPEARANCE OF COMPLETED CRUTCH AND ABOVE TEATS



9. THE COMMENCEMENT OF THE OPENING UP OF THE FIRST LEG



10. COMPLETED BLOW OF FIRST LEG

this varies in different localities. Some flockmasters take off considerably more than two blows—sometimes up to half the belly wool is shorn off. A crutcher should be guided by the flockmaster in this matter, which should be settled before crutching of a flock starts. These blows above the teats are chiefly for the benefit of the suckling lamb, which often has great difficulty in finding the teats if the wool has not been removed at crutching.

The writer has always shorn off the belly wool after cleaning out the crutch. It is easier to clean the crutch first and then take off the belly wool, though many take off the belly wool first and do the crutch second. It is, however, just a matter of choice and no hard-and-fast rule can be laid down as to which should be done first. With other sheep such as lambs, wethers, rams, etc., other action is necessary at this point of the crutching, but this will be dealt with later.

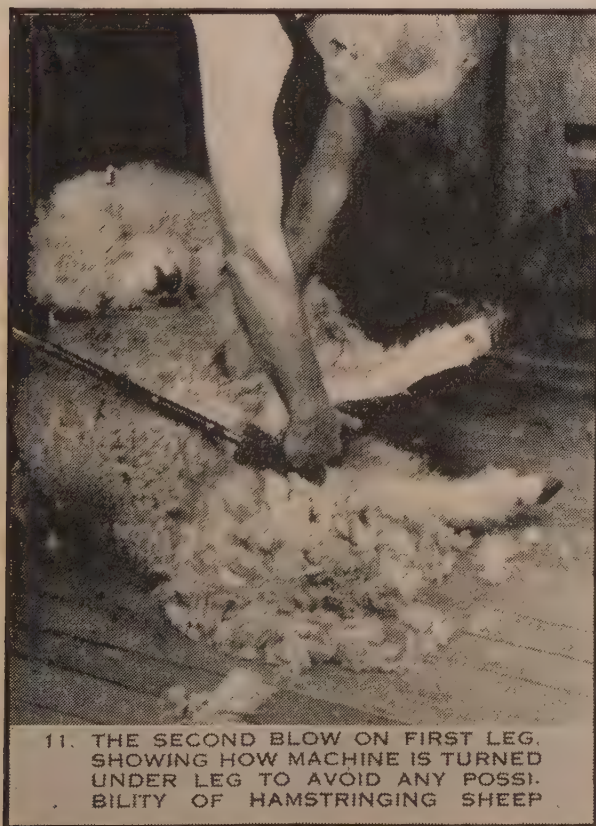
Fig. 9 shows the position in beginning the opening up of the first leg. The position of the sheep has not been altered much, except that it now lies facing out on to the board against the crutcher's legs. With a light pressure of the free hand in the sheep's flank to hold the leg straight the machine is directed into the wool immediately above the tail. This blow is carried right out to the hock as shown in Fig. 10. After the completion of this blow another full blow will be necessary to shear off the balance of the wool and the machine should travel along the margin left by the bottom teeth of the comb when completing the second blow in the crutch.

Fig. 11 illustrates how on the second blow just described it is essential to turn the hand and handpiece when travelling down the leg to avoid any possibility of hamstringing the sheep. The possibility of hamstringing by this style of crutching is not very great with ewes or other big sheep, provided the machine is turned as shown, but with lambs the risk is very much greater. This is recognised as one of the disadvantages of this style of crutching. If the machine is turned correctly, however,



no danger of hamstringing the animal can occur, for should it kick and the machine is turned under correctly, the leg comes back past the machine and not straight on to the front of the comb as it would if the machine is travelled straight down the back of the leg. Another disadvantage claimed with this style is the dangerous pressure brought to bear in the sheep's flank, particularly with breeding ewes, when opening up the leg as illustrated in Fig. 9. This, however, can be completely obviated provided the crutcher understands and carries out this blow correctly.

Fig. 12 shows how with the knuckles only very little weight on the flank is required to keep the leg straight. Fig. 13 shows how damage to the in-lamb ewe can be done very easily with the fist buried into the sheep's flank with unnecessary weight bearing on the ewe. A bad habit practised occasionally on this blow is for the knee to be used instead of the fist, with the crutcher actually kneeling on the sheep while opening up this first leg. On completion of this leg the area around and over the tail is now cleaned out. Care is needed to see that the sheep is not cut while doing these blows. Fig. 14 shows the stance, and from this position a favourite short cut is one full blow down from just below the tail right down the back of the last leg. Fig. 15 illustrates the completion of the sheep, and at least two full blows are necessary to shear off sufficient wool to balance the cut on the first leg. It will be noticed from Figs. 9 to 15 that the position of the crutcher has not altered, except that in Fig. 9 he is side on to the porthole, while in Fig. 15 he is back on. No distinct movement is made during these blows, but, as with shearing, a gradual movement takes place automatically while performing the blows. It is essential, however, for the crutcher to move backward gradually from the sheep after Fig. 9 and allow the animal to lie more flatly on the board. Provided the head of the sheep is controlled and not allowed free, the sheep will lie



THE CRUTCHING OF SHEEP



13. THE WRONG WAY OF HOLDING THE LEG STRAIGHT WITH THE FIST BURIED IN THE SHEEP'S STOMACH



14. CLEANING OVER THE TAIL



15. COMPLETION OF LAST LEG



16 THE COMPLETED SHEEP

THE CRUTCHING OF SHEEP



17. COMMENCEMENT OF THE
SHEEP. FANTAIL STYLE



18. OPENING UP THE FIRST LEG



19. COMPLETION OF THE FIRST LEG



20. CLEANING OVER AND AROUND TAIL

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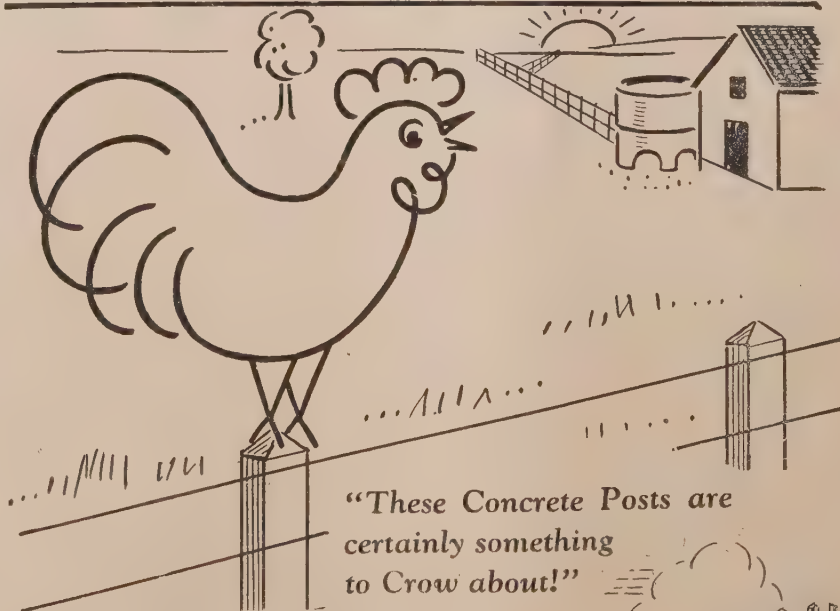
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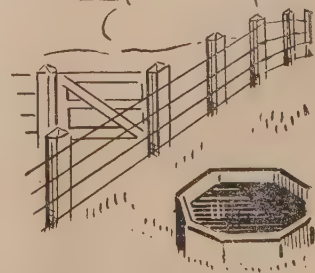


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quietly. On completion of the crutching the animal should be assisted to its feet by a pull of the fleece and with assistance of the crutcher's legs. Fig. 16 shows the completed sheep. By this style of crutching the finished sheep may not look as "pretty" as with the fantail style, but, provided the crutching has been done thoroughly, "prettiness" does not matter a great deal.

Crutching correctly done leaves the main crutching lying apart from the belly wool and short wool from the insides of the legs, though this is not shown clearly in Fig. 16. In small sheds it is the usual practice to make one line of the crutchings, but in larger sheds two lines of crutchings are made, and if a "broomy" is employed he can sweep the short wool and belly wool aside by the correct use of the broom and so assist materially when the rest of the crutchings go up to the table for sorting over.

STYLE No. 2

Figs 17 to 24 illustrate what is known as the "fantail" style of crutching. The starting position of this style is shown in Fig. 17 and the main difference in the position between this and the style already described is that the sheep should be facing straight down the board or slightly in toward the porthole. The first blow is straight down the leg to the hock and then the crutch is cleaned out similarly to the first style. It is not always possible to run the machine right around the crutch in one non-stop blow in this position, and sometimes the crutcher will make his first two blows travel just half-way round the crutch and then pull his handpiece right over across the sheep and work out the balance of the crutch. It is found that the cleaning of the crutch with this style is just a little slower than with style No. 1.

The belly wool is taken off in the same way as in style No. 1 and then the sheep is turned and lies against the crutcher's legs as in Fig. 18, but instead of facing out



as in Fig. 9, it faces in toward the porthole. Figs. 9 and 18 show that the commencing leg in Fig. 9 is the last leg in Fig. 18 and vice versa.

A slight pressure in the sheep's flank keeps the leg up and stiff and the machine is run from the hock straight down the leg and comes out a little way from the tail. Two or three more blows are needed to clean the balance of the wool out to the edge of the tail, as shown in Fig. 19.

The free hand will be of assistance while cleaning out, around, and over the tail as in Fig. 20; here again care should be taken that the machine does not cut the animal. Two or three blows will be necessary to complete this position and the left hand should now be grasping the sheep above the hock as shown in Fig. 21.

The last leg is begun as shown in Fig. 22, the initial blow being from the hock straight down to the tail. Two or three blows are generally sufficient to finish the sheep off as shown in Fig. 23. If fantail crutching is to be done properly, it is now necessary from the position as shown in Fig. 23 to run the machine right around the outside edge of the crutching to cut off the "rat-tails" which this style of crutching inevitably leaves. One swinging blow suffices. This blow is not always done, however, and the result is that after the first fall of rain the wool drops down, and the longer the wool when crutched, the longer the "veranda" or rat-tails. Fig. 24 shows the completed sheep, and as the last swinging blow has not been done purposely to bring this point out, the rat-tails are very noticeable.

The crutching of in-lamb ewes only has been dealt with in the two styles so far described. Crutching of ewe lambs or hoggets is done in the same way, except that the blows above the teats are omitted, as they are not necessary with dry sheep.

THE CRUTCHING OF SHEEP



23. IN READINESS TO RUN THE MACHINE AROUND WHOLE CRUTCH TO TRIM OFF THE LONG ENDS



24. THE COMPLETED SHEEP



25. POSITION FOR CLEANING AROUND THE PISEL



26. COMMENCEMENT OF PISEL. NOTE HOW WOOL HAS BEEN OPENED TO ALLOW MACHINE TO ENTER EASILY

Wether lambs, wethers, or rams are crutched similarly to other sheep, with cleaning up round the pisels and purses replacing the blows above the teats.

Unless the stained and dirty wool is removed from around the pisel, infection may set in and cause considerable damage to the animal. Fig. 25 shows a wether before this area has been cleaned out. Learners often have great difficulty in cleaning this area thoroughly, because great care must be taken that the animal is not cut with the machine, and as a result this job is often slummed. If the free hand is used to pull the belly wool up and away from the pisel, it will allow the machine to enter the wool easily and lessen the chances of cutting the sheep.

Fig. 26 shows the wool pulled up and the machine just entering the wool. Two or three short blows are generally sufficient to clean enough wool from around this area. It is difficult to define these blows, which are better worked out by the crutcher himself. However, to make a good job of this blow the machine should always be brought right out to the edge of the wool with each stroke, thus ensuring that all wool is cut. Unless the wool is cut right at the edges, the animal is not likely to keep much cleaner, as the long ends will hang down and still be fouled. Fig. 27 shows the blow finished; when the job is done correctly the wool is shorn off from all sides of the pisel, not from one or two sides only, as is often done. Wethers' purses should also be shorn clean of all wool. Opinions differ as to what should be done with rams; the pisels of Southdowns and similar breeds of rams are sometimes not done, and the quantity of wool on the purse determines whether or not it should be done. In some districts wool on the back of the purse is shorn off, but wool on the front is left to act as a cushion and help to obviate damage to the animal. The wool of the longer-wool type, of rams, which are always shorn earlier than the balance of the flock, has by crutching time grown to such a length that it is essential to clean a slightly larger area from around the pisel than would be done to

THE CRUTCHING OF SHEEP



28. FOOT-ROTTING OF SHEEP IS A USUAL PRACTICE IN SOME SHEDS AT CRUTCHING TIME.

[Sparrow Industrial Pictures Ltd. photo.]

a wether. The purse should also be shorn, either back and front or at the back only.

At the crutching muster other work can be done on the flock if necessary. The size of the farm and the ability to muster determine whether work other than crutching will be necessary at the crutching muster. Fig. 28 shows a bad case of foot-rot. Every sheep at crutching should be examined for unsound feet, and arrangements should be made either for the crutchers to do the foot-rotting where necessary or for sheep needing attention to be taken from the crutchers on completion to have their feet trimmed up and foot-rot attended to. Bad cases of foot-rot should be raddled and drafted into a hospital paddock for further treatment later if necessary.

In districts where "eye wiggling" or "clipping" is necessary it should be done in conjunction with crutching. Breeds of sheep which grow wool on the sides of the nose and right down from the topknot must have that shorn off, as if it is left the animal becomes wool-blind and is likely to blunder into a hole or creek and be lost. Fig. 29 shows a sheep being eye clipped. It is a matter of opinion whether this operation should be done just before the sheep is let out of the porthole after crutching or when the sheep is brought out of the catching pen and before crutching starts.

It is the duty of the flockmaster to indicate whether he desires foot-rotting or eye clipping to be done, as these jobs are not the crutcher's responsibility unless he is expressly instructed by the flockmaster. If foot-rotting or eye wiggling is to be done, crutchers must be paid an increased rate.

As with shearing, if the crutching is done correctly the wool or crutchings can be gathered up with the lamb-boards as shown in Fig. 30 and carried to the wool table for sorting. Fig. 31 shows how the boards are turned,



27. THE COMPLETED PISEL

THE CRUTCHING OF SHEEP



29. WIGGING OF WOOLLY SHEEP IS ALSO DONE AT CRUTCHING TIME WHEN IT IS NECESSARY



30. METHOD OF PICKING UP THE CRUTCHINGS OFF THE FLOOR

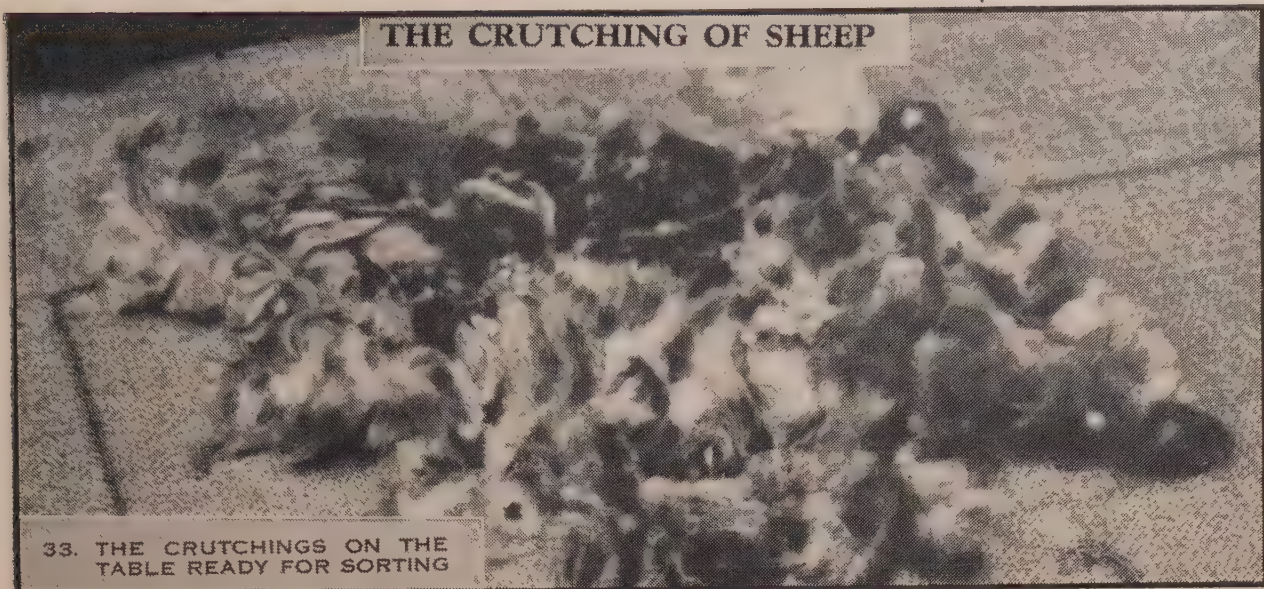


31. TIPPING THE CRUTCHINGS OVER



32. A DIRTY SHEEP

THE CRUTCHING OF SHEEP



33. THE CRUTCHINGS ON THE TABLE READY FOR SORTING

and the wool should drop on to the table as shown in Fig. 33, which illustrates how in a dirty sheep the dags lie together, making for ease of classing.

If the crutchings are handled in this manner it is not a very big job to pick out the dags and, if two classes of crutchings are being made, to select the "seconds" from the "first" crutchings. The handling of crutchings is important, as in a big shed, where the crutchings are being classed and perhaps 3 or 4 crutchers are doing 400 to 500 sheep each a day, the crutchings are coming on to the table in an endless stream, and unless the sorter can keep his table clean, sorting and classing cannot be carried out properly.

Fig. 32 illustrates the condition a sheep will get into in most districts in New Zealand if crutching is not carried out. Breeding ewes in such condition would return a very low percentage of lambs. Although good flockmasters dag breeding ewes when they are put out with the ram, a wet season with a flush of feed will very quickly produce the condition shown in the illustration. Lambs or dry sheep often come in for crutching in the state shown, and an advantage claimed for the fantail style of crutching is that it is easier to clean up dirty sheep by this method than by method No. 1. Whichever style is used, a daggy sheep is hard on combs and cutters, the back, and the temper. Pace is of no advantage in handling such sheep and care must be taken, as it is the daggy sheep which suffers more skin cuts.

As this article is intended expressly for learners, no attempt has been made to describe various short cuts and adaptations of the holds illustrated, as knowledge of such short cuts is often detrimental to a learner. It will be found that perfect control of the sheep and correct positions must be obtained before most of these short cuts can be used successfully, and no learner should attempt to use these blows until the principles of crutching have been learnt and mastered. There is no doubt that the ability to crutch is a big aid to a man desirous of learning shearing.

In conclusion a little advice on "gear"—handpiece, combs and cutters, and clothing—may assist the learner and make the job easier for him. Handpieces are part of the shed equipment and are available when commencing in the shed. The crutcher, however, provides his own combs and cutters, and assuming that as a learner he has little knowledge of what is required, the following will be of some assistance to him.

New combs will have to be bought by a crutcher beginning his first season, but if one or two half-worn combs can be obtained, this will be a decided advantage, as worn combs are generally best for crutching. If new combs have to be used, the beginner should ask a shearer or someone who understands this phase of the work to do up the points of the combs before crutching starts. Doing up the points of a comb means knocking back the sharp points of the comb and thinning out a little between the points. The ideal point of a comb should be similar to that of the point of an ordinary table knife, nicely rounded and with no sharp point. This attention to gear is a study of its own and no further attempt will be made here to elaborate on it. Though there is not perhaps the same need to have the handpiece and combs and cutters operating as perfectly for crutching as for shearing, it will be found that the more efficiently gear is cutting, the easier it is to crutch.

Knowledge gained at crutching time in the correct use and maintenance of gear assists a learner when commencing shearing.

New cutters require very little to be done to them, other than "backing" on the emery grinder. The cutter should be grasped between the thumb and forefinger and the back of the cutter applied to the comb emery. This will level up the back of the cutter and a short, sharp pressure on the emery is generally sufficient to grind off any small irregularities which sometimes occur on the back of the cutters. A wire shaped like a letter S should always be used for holding cutters and the cutters should be kept moving in rotation from this wire to the machine and back again as required. This will eliminate the irregular wearing of cutters which will occur if they are kept loose in a box and used indiscriminately.

Clothing for crutching, as for shearing, should always be woollen. The hard work of crutching causes profuse perspiration, and unless the body is protected adequately by woollen clothing, the cold winds generally experienced at crutching time may give a crutcher a chill which could develop into something more serious. The use of woollen underclothing also assists in the prevention of grease boils, a complaint feared by all shearers. Sack moccasins made from bags or sacks are most suitable for footwear.

One wishing to develop into a first-class crutcher and later into a first-class shearer should always remember to master the correct technique first and allow pace to develop automatically later. "Don't hurry" is a wise maxim.



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FARM WORK FOR MARCH

By the Fields Division.

COMPLETION of the harvest, topdressing of pastures, the sowing of greenfeed and new pastures, and many other jobs which require attention before the weather becomes too cold usually mean that March, like the two preceding months, is a very busy period for farmers.

HARVESTING

In many localities, particularly in more southerly districts, there is a considerable amount of crop still to be harvested. It is usually some time in March before crops of peas, linseed, linseed flax, wheat, etc., sown in late spring are mature. As there is less heat in the sun during March than in January and February, more care is necessary to see that crops are properly fit for harvesting. Cereals and other seeds will not mature in the sacks during March as readily as they will in the hotter months.

GRASSLANDS

Pasture establishment: In many parts of the North Island and in warmer parts of the South Island March is a very suitable month for sowing down permanent pasture. Earlier sowings are recommended in districts where clover growth is likely to be damaged by frost lift. Seed of known strain, germination, and purity should be sown down on a fine and firm seed-bed. Cheap seed often proves very dear in the long run. The grass and clover mixture most suitable for the district should be sown with a phosphatic fertiliser to ensure rapid establishment.

Pasture management: Topdress pastures with phosphatic fertilisers to strengthen the pasture before the winter so that it will come into maximum production immediately with spring growth. In warmer districts topdressing now will also promote a certain amount of winter growth. As conditions permit pastures should be harrowed to spread animal droppings. Topdress pastures with bran and paris green or bran and lead arsenate to control the caterpillar of the porina moth.

Greenfeed: Italian ryegrass or short-rotation ryegrass sown this month will provide good winter and early spring feed, after which paddocks may be closed for a seed crop. The inclusion of either red or white clover seed in the mixture will lengthen the life of the pasture by another year or more, if that is desired, and it may also be possible to obtain a crop of white or red clover seed in the second year. In suitable districts blue lupin sown with a grass and clover mixture at one bushel to the acre will assist in protecting the young sward during the winter and will also provide good sheep feed in early spring. Algerians, Dun, or Garton oats may also be sown now for greenfeed. As new season's seed of Algerian oats usually gives a poor germination, farmers should make sure that the germination is satisfactory before sowing this variety.

Irrigation: Droughts often prevail at this time and regular irrigation of pastures and lucerne areas is essential for maximum production. Young pastures, especially those sown in the spring of 1947, will require frequent watering, as they are unable to withstand dry weather as well as older pastures that have a good ground cover and a deep rooting system. Irrigation should continue until late autumn, as this encourages early growth in the following spring.

The third cut of lucerne for hay should be taken, and as soon as it is off the paddock irrigation should be carried out to help new growth. A light grazing with a big mob of sheep may be made later if there is not enough growth for a fourth cut. It is a wise precaution not to graze lucerne plants too much just before frosts begin or growth will be retarded in spring.

Red clover seed crops may require irrigation to fill the seed if conditions are very dry. As soon as the white clover seed crop is harvested the field should be watered to encourage new growth. When convenient, fields should be cultivated to control weeds preparatory to border diking early next season.

CULTIVATION

Land out of grass which has been skim ploughed and cultivated may now be deep ploughed in preparation for being sown in wheat during May or June. Where there is heavy stubble growth and it is desired to sow a second crop of wheat the stubble should be burnt when conditions are favourable and the land deep ploughed as early as possible. Plough rape ground for autumn wheat.

POTATOES

Digging of the main crop of mid-early varieties will be started this month in the South Island. Avoid digger damage to the tubers as far as possible, and any potatoes which have to be stored on the farm during the winter should be amply protected from frosts.

HARVESTING OF RED CLOVER SEED

Harvest red clover seed as crops mature. Whether the crop is direct headed or windrowed and picked up from the windrow, care should be exercised while threshing to reduce cracked and broken seed to a minimum. If a considerable amount of roughage is left lying on the paddock after harvest, it should be removed, as it may cause rotting of the crowns of the plants and eventually the plants may die.

LUCERNE

Many lucerne stands will produce their third cut during the month. They should be cut at a time which will permit the crop to develop an appreciable amount of growth before heavy frosts are likely. Lucerne should not be sown this month unless sowing at this time has proved successful in the locality. Because of the possibility of frost lift a March sowing in many districts is rather late to ensure a successful stand.

STOCK

Lambs fattening on grass should be kept going by constant changes on to fresh feed, and pastures should be kept fresh and clean. Lambs on rape should be changed on to a clean break every fortnight. A watch should be kept for scald and parasites so that preventive measures can be taken immediately. If store lambs are brought in for fattening they should be dipped, crutched, drenched for parasites, and kept on feed by themselves for at least a fortnight.

Before the ewes are put with the rams tails should be clipped clean, and after rams have been with the ewes two or three weeks additional young fresh rams should be put out.

Measures to control foot-rot should be carried out this month. Every sheep in the flock should be handled and all feet trimmed and pockets in the hooves opened out. Sheep showing signs of foot-rot should be isolated and treated. All sheep should be run through a bluestone bath periodically.

GENERAL

Fence off stacks from stock and make stacks weather proof. Much hay is wasted annually through stock having access to the stacks or because stacks have insufficient protection from weather. As opportunity permits repair fences and metal gateways. Farm machinery should not be left exposed to the weather; as soon as harvesting is completed put all machinery under cover.



55-1-2

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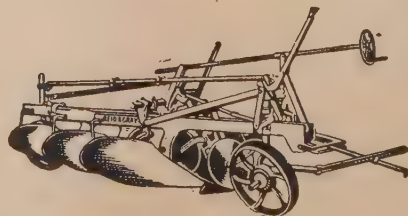
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Irrigation of Citrus Orchards at Kerikeri

By P. EVERETT,
Orchard Instructor, Kaikohe.

EQUIPMENT for the irrigation of citrus trees has already been installed in no fewer than 26 orchards at Kerikeri. Results of the application of even relatively-small quantities of water are distinctly encouraging, and this article is intended as a guide to irrigators in that locality.

ON many occasions since the first commercial citrus orchards were planted at Kerikeri in 1929 individual growers have considered seriously the possibility of providing water for irrigation. The mean monthly rainfall at Kerikeri is about 5.6in. and the lowest mean for any month is 4in., but frequently periods occur when the surface soil to a depth of about 8in. is believed to lack sufficient moisture to maintain citrus trees in full vigour. The factors mainly responsible for bringing about that condition and accentuating the consequent ill effects on the trees are:—

1. The crumb structure of the soil permitting the rapid loss of soil moisture by evaporation to a greater depth than in soils that are more binding.

2. The porous nature of the soil permitting excess water to drain away rapidly.

3. A low water table (probably more than 15ft. below the soil surface in most orchards).

4. The firmly-compacted nature of the subsoil, tending to confine the development of the main feeding roots of citrus trees to the surface soil.

Observations made over many years by old-established orchardists, and supported by rainfall records in more recent years, indicate that relatively-dry periods occur mainly from October to March and that when they occur, particularly during October, November, or December, they invariably have an adverse effect on the setting of the fruit from the main spring blossoming or cause an appreciable dropping of the fruits shortly after setting, resulting in lighter crops. The exceptionally-severe drought periods experienced during the 1945-46 and 1946-47 seasons, together with the evidence secured from an extensive series of soil moisture tests taken in orchards at Kerikeri during the 1945-46 season, still further demonstrated the need for orchard irrigation.

Several streams traverse or skirt the fruit-growing area, and the water in



A dual-purpose concrete reservoir at Kerikeri with a capacity of 37,000 gallons. [F. Dickeson photo.]

all of these has been analysed and found suitable for irrigation. These streams have also been measured to ascertain the quantity of water available in drought periods.

Present Equipment

The urgent need for the irrigation of orchards in the 1945-46 season and again in 1946-47 induced many growers to install pumps and pipelines from adjacent streams or bores to their orchards. One of those installations was completed in 1945 and several more early in 1946, but a far greater number were not completed until the 1946-47 season. In many cases where the only water available is from bores concrete reservoirs have been built, ranging in capacity from 5000 to 40,000 gallons. Most of those reservoirs are near the residences of the owners, and when the reserve of water is not required for irrigation the reservoirs are used as swimming pools. The pumps installed to supply water to individual orchards have capacities varying from 120 to about 1500 gallons an hour.

During the 1946-47 drought period most irrigators applied from 80 to 100 gallons a tree at each irrigation, but in at least one case about 600 gallons a tree was applied. The number of waterings during that season ranged from one to seven and the frequency of applications varied from 10 to 21 days, with few exceptions, during rainless periods. Intervals between waterings in excess of 21 days were necessary in some orchards because insufficient water was available for the applications to be made more frequently.

In most cases the water is carried through the centre of the orchard in permanent mains of galvanised piping. From the mains the water is taken at right angle along the rows of trees,

a variety of types of rubber and canvas hose and piping being used for this purpose.

In some orchards light, portable pipelines with quick-coupling devices are used to convey the water from the main. These are fitted with roses or spray jets at tree intervals. Where the water supply is adequate the portable laterals are placed midway between the trees and the water sprayed as far as the trees on either side, thereby irrigating the whole of the area. Where the water supply is insufficient for complete irrigation a supplementary irrigation is secured by placing the lateral pipes beside the trunks of the trees and allowing the water to be sprayed upward into the branches; the foliage breaks the spray and the water falls under the spread of the tree.

In other instances a tap is fitted to the lateral pipeline opposite each tree, or several lengths of rubber hose are used to convey the water from one tap to a number of trees. In such cases a sprinkler is attached to the outlet end of each hose or no spraying device is used and the water is allowed to flow at will.

Where the water is being carried from the lateral pipeline to individual trees by rubber hose, it is possible to water four trees at one time from a single tap by the use of a distributor having a single intake and four outlets. To give a uniform flow of water from each outlet when operating on uneven ground, the aggregate size of the four outlet apertures must be less than the size of the intake aperture. Where the pump capacity was 250 gallons an hour a locally-made distributor of the following dimensions appeared to give satisfactory service: A cross of 2in. galvanised pipe had all ends fitted with

IRRIGATION OF CITRUS TREES . . .

a reduction socket of a size to fit into the hose that conveys the water to the trees. Inside each reduction socket the aperture was reduced to $\frac{1}{4}$ in. diameter by welding in a nut of suitable dimensions. On the top centre of the cross was cut a hole, over which was fitted a short upright length of pipe, to which was attached a length of lin. hose conveying the water from the portable lateral pipeline.

So far no systematic trials have been undertaken in the area to determine the effects of complete or supplementary irrigation or to ascertain the minimum quantity of water or the frequency of application necessary to maintain trees in full vigour. Until that data has been secured by well-planned field trials no definite system can be recommended with complete confidence.

Results of Observations

Observations made during the period of soil moisture testing mentioned indicated that permanent wilting of the foliage occurred at about the same time as the surface 6 in. of soil reached wilting point, and that several weeks before the wilting of the foliage there was appreciable dropping of mature foliage and young fruits. Throughout the 1945-46 drought period the soil moisture content 6 to 12 in. below the surface never reached wilting point. The extremely-shallow rooting system of all citrus trees in the locality is no doubt a major factor in bringing about this early adverse effect of drying out of the surface soil.

Further observations indicated that where 80 gallons of water a tree was applied to 10-year-old trees showing 100 per cent. foliage wilt, and the water was spread uniformly over the area covered by the spread of the tree, the whole of the foliage resumed normal freshness in not more than four hours after the application and no further wilting occurred during the following 14 to 21 days. In another case 12 gallons of water applied to six-year-old trees showing 100 per cent. foliage wilt caused the foliage to resume normal freshness but further wilting occurred from 5 to 8 days later; in that case the water penetrated to an average depth of about 3 in., and the high evaporation rate under such conditions no doubt accounted for the early resumption of foliage wilt.

During drought conditions tests were made to ascertain the extent to which irrigation water spread on and beneath the soil surface when applied to a single point beneath a mature citrus tree. In one typical test where there was a gentle slope water had been applied 24 hours previously at the rate of 33 gallons an hour for three consecutive hours; the area of the soil

surface wet to a greater depth than 2 in. was about 5 square feet, and beneath the surface the water had spread at an angle of about 45 degrees from the margins of the wetted area and had penetrated deep into the subsoil, where there were extremely few tree roots and where the moisture content was adequate without irrigation.

In all instances where the furrow system of irrigation was observed in cultivated land there was evidence of appreciable soil erosion.

General observations made in a large number of orchards during both of the drought periods referred to indicated that defoliation and dropping of young fruits began earlier in orchards sown down in pasture and



[F. Dickeson photo.]

A locally-made four-way water distributor which enables four sprinklers to be operated at once from a single tap.

mowed regularly than in comparable orchards where a fine tilth $\frac{3}{4}$ to 4 in. deep was maintained. Orchards that were cultivated in early spring and received little or no further cultivation to maintain a tilth or check weed growth appeared to show evidence of drought effect equally as early in the season as the orchards that were sown down in pasture.

Factors for Consideration

From the evidence at Kerikeri to date it is suggested that irrigators in that locality when planning for or carrying out irrigation give serious consideration to the following:—

1. The fact that defoliation and dropping of young fruits begin before the soil moisture percentage in the top 6 in. reaches wilting point suggests that factors other than soil moisture are involved. Possibly the availability of sufficient nutrients is the principal factor. Analysis of Kerikeri orchard soils has shown that the main concentration of nutrients is extremely near the soil surface and that the build-up of nutrients in the subsoil has been relatively small, even in well-attended orchards. Therefore it follows that trees depend mainly on the top

6 or 8 in. of surface soil for their supply of nutrients, and if trees are unable to draw nutrients from the surface soil to a depth of say 3 to 5 in. because of insufficient soil moisture, it is logical to expect that they will be unable to maintain the vigour required to develop a full crop. Furthermore, the loss of foliage must in turn reduce the amount of plant food available to the trees. The application of irrigation water before the moisture in the surface soil to a depth of 3 to 5 in. has reached wilting point is therefore recommended.

2. The feeding roots of citrus develop nearer to the soil surface under the spread of the tree than beyond that area, so the area within the drip circle requires irrigating earlier than other parts. Also, it is expected that the area outside the drip circle will require to be irrigated before the soil moisture reaches wilting point to the depth of the main feeding roots if the trees are to be maintained in full vigour.

3. As the feeding roots are practically confined to the surface 10 or 12 in. of soil, and the soil moisture at a greater depth has never been known to reach wilting point at Kerikeri, the maximum use of irrigation water would be secured by applying only sufficient to saturate the soil to a depth of not more than 1 ft. To prevent needlessly-deep penetration of the water and to ensure an even distribution over the area to be watered the use of sprinklers or spray jets is essential.

4. Though no accurate tests have been made, it is estimated that the water required to saturate the area within the drip circle of a mature citrus tree to a depth of 1 ft. is about 200 gallons. It is suggested that irrigation installations should provide at least for the supply of this quantity of water every 10 to 14 days.

5. Sufficient jets or sprinklers should be provided to irrigate at least one thirty-sixth of the trees in an orchard with not less than 200 gallons each at the same time. This envisages a six-day week and three shifts a day at about four-hourly intervals, which would enable the shifts to coincide with the ordinary breaks in work for meals, and at the end of the last watering for the day—say 9 p.m.—the system could be simply turned off, leaving the moving of pipes until the following morning.

As there is an urgent need for further information on the effects of irrigating citrus trees under New Zealand conditions, all irrigators are requested to keep records of the dates of irrigating, the quantity applied per tree, and the extent of the area to which the water is applied, so that data can be accumulated and used as a guide for future operations.

The Feeding of Ducklings and Ducks

IN many respects ducks are fed similarly to poultry, and this article deals with practical aspects of feeding both young ducklings and adult ducks, though some of the recommendations made cannot be implemented at present because of poultry food shortages. The article concludes with some general advice on the raising of table ducks.

DUCKLINGS from a day old are fed on moist mash, carefully made into a palatable, crumbly condition. Care should be taken to avoid feeding a sloppy, wet mash, though it is desirable to increase the amount of water added when mixing the mash after the first 10 to 14 days. This mash is fed in small quantities, such as will be cleaned up readily by the ducklings, five times daily during the first week to 10 days, after which the number of feeds may be reduced to four daily, evenly spaced over the hours of daylight. The mash may be given in troughs or on feeding boards, but whatever the utensil used ample feeding space is essential. It is undesirable that ducklings should scramble in competition with each other to obtain adequate food; such scrambling may lead to leg injuries and lameness.

The depth of food in a trough or on a board is of some importance. Ducklings readily paddle down any food given to them, and if food is given in quantity in a deep trough, some of it may be left in a solid trampled mass at the bottom. These remarks do not apply to ducklings raised in a battery, where they feed from troughs through a wire grid.

Diet for Ducklings

At present ducklings should be fed during the first two months either on standard chick mash No. 1 (containing meat meal), or on standard chick mash No. 2 (without meat meal) to which is added 6 per cent. of meat meal and 5 per cent. of dried milk powder. If liquid skim-milk is available, it may be used in mixing the mash instead of the 5 per cent. of dried milk powder. When food supplies are normal any balanced chick mash may be used.

Unless the ducklings are permitted to run outside and thus get the full benefit of sunlight, 2 per cent. of a feeding oil containing vitamin D should be added to the mash until they are allowed outside. Ducklings, like chickens, will contract rickets unless allowed sunlight or fed a vitamin D-rich oil and mineral salts (finely-ground carbonate of lime, 1 per cent., and common salt, 1 per cent.).



[Sparrow Industrial Pictures Ltd. photo.]

Ducklings benefit from green food such as chopped silver beet, chou moellier, lettuce, and young oats. Green food may be fed readily by chopping it finely and including it in the mash. Water at all times is essential, and it is recommended that the drinking vessels be sufficiently deep to allow the ducklings to immerse their heads when drinking.

From eight to ten weeks of age until coming into lay, ducklings may be fed on standard chick mash No. 2, with 2 per cent. of meat meal and 2 per cent. of dried milk powder added. In normal times an ordinary chick-growing mash containing a small quantity of meat meal and dried milk can be recommended. If it is intended

to introduce a daily grain feed for ducks in lay, it is wise to start grain feeding gradually at three months of age. Ducklings may not take to grain readily if previously fed entirely on mash, so small quantities of grain are mixed in with the mash until the birds are well used to it. Thereafter grain should be given as a separate feed in place of one of the mash feeds.

During the earlier stages of the growing period three feeds daily are recommended, but they may be reduced to two as the birds approach laying.

When grain is fed (and that is not desirable at present while wheat is in short supply) a mixture of three parts of wheat and one part of kibbled maize can be recommended. The grain mixture can be fed on short grass and hard ground, but otherwise should be given in a trough with the grain just covered with water. It should not be fed in long grass or on soft ground, as waste will occur. Ducks shovel up their food and cannot peck at grain like poultry.

Feeding Adult Ducks

A feeding programme similar to that described for ducklings may be followed for adult ducks. One misconception must be discounted: The opinion that laying ducks require little

This article is the third and last of a series about ducks by F. C. Bobby, Superintendent of Poultry Husbandry, Wellington. The first, published in December, dealt with breeds and housing, and last month's covered the breeding, incubation, and rearing of ducks on a commercial scale. Further information about the raising of table ducks and killing and processing them will be published when the food position is normal and this type of production can be encouraged.

THE FEEDING OF DUCKLINGS AND DUCKS



A group of good-type Khaki Campbell ducks.

[Sparrow Industrial Pictures Ltd. photo.]

extra food if allowed to forage over grassland where there is a stream or a pond, the inference being that under such conditions they find the greater proportion of their food requirements. If they are to be induced to lay satisfactorily, ducks should receive a full ration of mash. Ducks are heavy consumers of food at all ages from the day-old stage onward, which is not difficult to understand in view of the rapid rate of growth of a duckling. An Aylesbury or Pekin duckling 10

weeks old may well weigh 5 to 6lb., compared with the 2½ to 3lb. of a heavy-breed chicken. The laying duck producing 20 to 25 3 to 3½oz. eggs a month must require heavy feeding to maintain such production and her body weight at the same time. A laying duck should therefore be allowed 5 to 5½oz. of food daily.

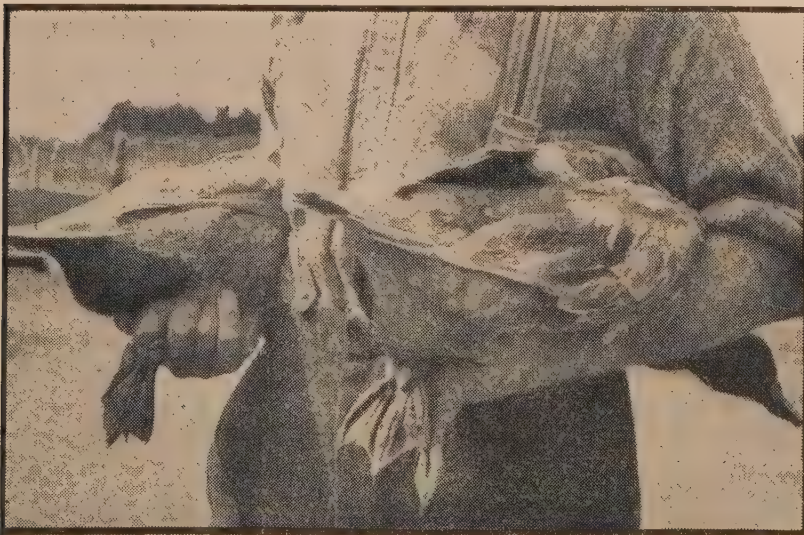
Under present conditions commercial duck farmers are using only mash, giving two meals daily, in the morning and about an hour before dusk.

Standard poultry laying mash is suitable for this purpose, and in normal times any well-balanced laying mash containing about 10 per cent. of a 60 per cent.-protein meat meal may be used; it may be given as a midday meal, with a grain feed morning and evening, or as the evening meal, with a good grain feed (2 to 2½oz. a bird) before the ducks are released in the morning.

Adult ducks, like young ducklings, should have fresh water available at all times. Furthermore, stale food is detrimental to ducks, and food which accumulates at the bottoms of drinking vessels which are not emptied and refilled regularly can cause serious trouble with ducks, including ducks being fattened for the table. Finally, the importance of feeding ducks of all ages at regular fixed times should be stressed.

Catching and Carrying

Ducks must be caught with care, as they panic easily when rounded up for inspection and catching. If driven into a corner, a large flock of ducks will scramble and pile up one on top of another, causing injury and resulting in suffocation if they are left in this condition for long. Split up a flock for catching, and use a wire or cord net on a pole, as illustrated. Catch and pick up ducks by their necks. They may be carried by their necks or put comfortably under the arm.



The under-arm method of carrying ducks.

[Sparrow Industrial Pictures Ltd. photo.]

Ducks may be scared readily by strange dogs or cats, resulting in a rapid drop in egg production if the birds are in lay, and young ducklings are readily disturbed and harmed by rats or weasels.

Disease Not Common

Disease among ducks and ducklings is not common and causes far less trouble than in poultry. However, if unexpected and heavy losses are experienced, dead birds should be sent immediately to the Animal Research Station, Wallaceville, for post-mortem examination. A trouble sometimes experienced with ducklings during rearing is "sprawling," or going off their legs. In the vast majority of cases this is a management problem, associated with damp and cold conditions, exposure to a cold draught being a frequent cause, but it may also be caused by a form of sunstroke where the birds are exposed to hot sunshine without shade in which to take shelter.

Comparatively-recent investigations at the Animal Research Station, Wallaceville, have indicated that severe leg trouble may be caused by a shortage of vitamin E. Instances of this form of leg weakness have been found among ducklings fed a ration containing neither wheat nor wheat meal, wheat being a normal source of vitamin E for both poultry and ducks. This type of leg weakness can therefore be avoided by ensuring that the ducklings receive a reason-

COMMERCIAL DUCK REARING



[Sparrow Industrial Pictures Ltd. photo.
Catching a duck with a net.



[Sparrow Industrial Pictures Ltd. photo.
Another method of catching and holding a duck.

able amount of either wheat or wheat meal.

Table Bird Production

It is not proposed to give a detailed account of table duck production, as this aspect of duck raising cannot be encouraged because of the present shortage of poultry foods, but there are always some surplus drakes for sale where ducks are raised for egg production.

Ducks may be killed for eating at one of two stages, without taking account of cull adult ducks and drakes for disposal after laying or after a breeding season. The finest-quality ducklings are those sold immediately before the growing of the adult plumage. The age at which that occurs

varies with the breed and season of the year, but it is about nine to eleven weeks. The birds must be watched carefully as soon as the flight feathers reach about 4in. long and tend to meet at the end of the body. Ducklings must be killed before the stubs of the adult plumage show up. Once the adult plumage starts to grow the ducklings must be allowed to feather completely, during which period (up to six weeks) the bird loses condition. When fully feathered the birds should be fattened again before being killed. This is the second stage at which table ducks may be killed, but the quality is not as good as that of ducklings killed at the first stage.

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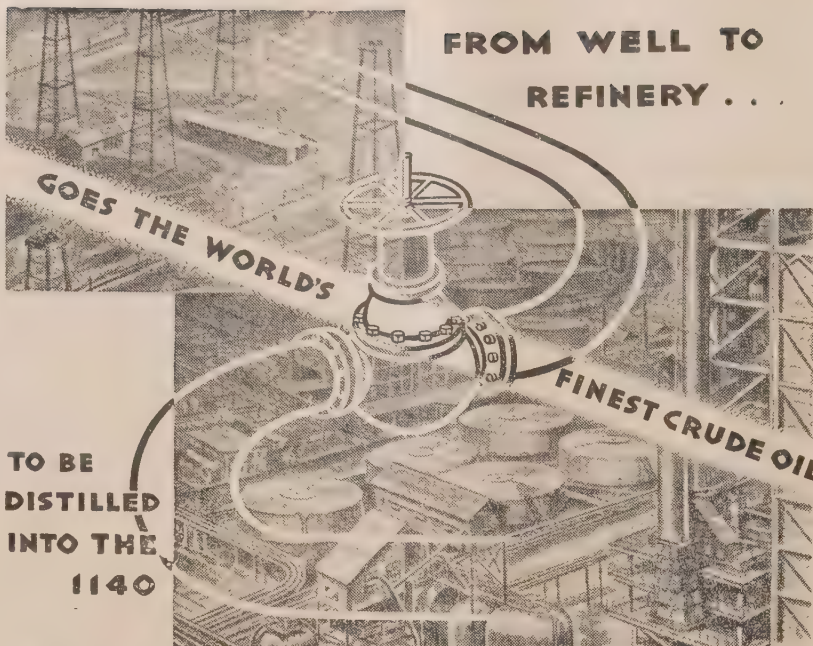
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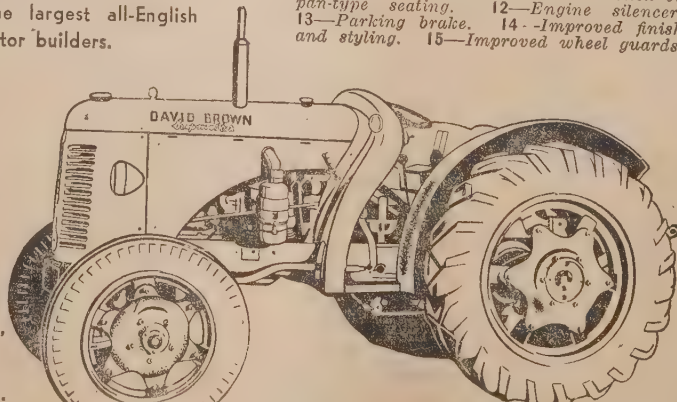
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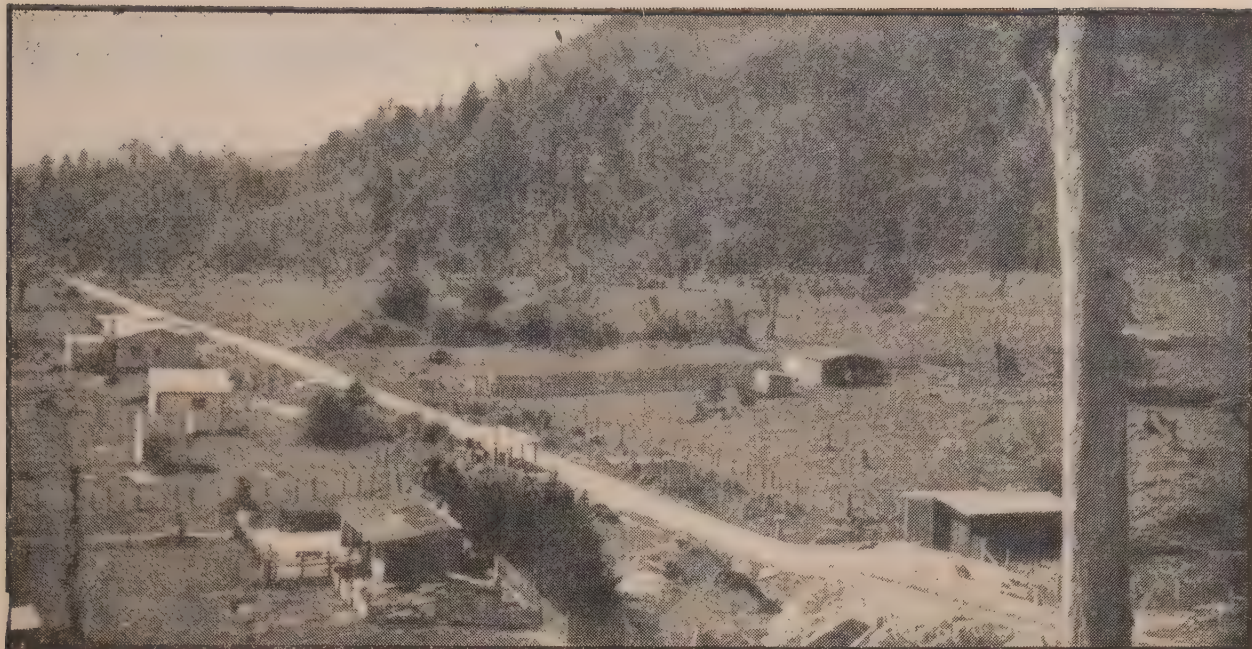
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A Survey of Rural Nelson and Marlborough

SOcial activities and amenities, housing, and the usage of land are reviewed in this, the concluding section of an article reporting the results of a survey of rural Nelson and Marlborough by F. R. Bray, who at the time was Field Economist, Rural Development Division, Wellington. The first and second sections appeared in the December and January issues.

IT is interesting to see if economic development influences the character of social organisation. Briefly summarising the difference between social life in urban areas and that in the country, it might be said that a small community has greater need to make use of its available human resources than a larger community, though the people best able to develop such latent talent as does exist will usually be found in the urban centre. The contact between representative and represented can be closer and more personal than in congested urban areas. As the town grows, though there is a wider range of activities, there is greater competition for membership and more spectators in relation to participants, and if standards of attainment become higher the practice which membership of an organisation entails must mean a restriction of interest to fewer activities. In a larger town or city it becomes more necessary for individuals themselves to take the initiative in joining community activities.

Even the smallest country towns hold periodic dances and card evenings. Sporting activities are well represented except in some which suffer from inadequate facilities. Strangely enough, in several small townships cricket holds more attention than football, which may be the result of the possibility of active participation over a longer period. Religious and primary school activities are invariably present, church services in particular being by their nature a neighbourhood activity. Consequently in the smaller centres most social activities often revolve around church and school and, especially in isolated districts, there are no more important local people than the schoolmaster and the clergyman, who, with the radio, represent the cultural links with the outside world. Usually there are no specifically educational, artistic, or political adult organisations but rather all-purpose organisations such as branches of Federated Farmers and its Women's Division, the Returned Services Association, and the Women's Institute. Nor are there any films or concerts. Any activities which have a limited

appeal, which are primarily a spectator activity—for example films—or otherwise depend for their strength on numbers—political groupings or friendly societies—are at a disadvantage.

In the second type of country town (the "weekly" town) films are a regular feature and local concerts, suffering as a result of better transport and the radio, are held at infrequent intervals. The organisations often found in the smaller towns are invariably present and sometimes in addition Workers' Educational Association classes, branches of political parties, and occasionally lodges. The school is possibly a consolidated one. But there is not the clear-cut distinction between these two types of towns in social organisation that there is in their economic life and the influence of proximity to larger centres is again very apparent.

The larger country centres usually have more complete sporting facilities, including Rugby football, tennis, cricket, bowls, golf, and croquet, with basketball and hockey usually confined to the school. W.E.A. classes are usually held, and a more complete list of organisations serving the needs of country folk would include the Plunket Society, A. and P. society, and horticultural, first aid, and welfare societies. Most of these centres will have a district high school.

HEADING PHOTOGRAPH.

On the road to Karamea are isolated farm lands won from the forest, and mile upon mile of beautiful bush scenery. Photograph by Neville R. Lewers.



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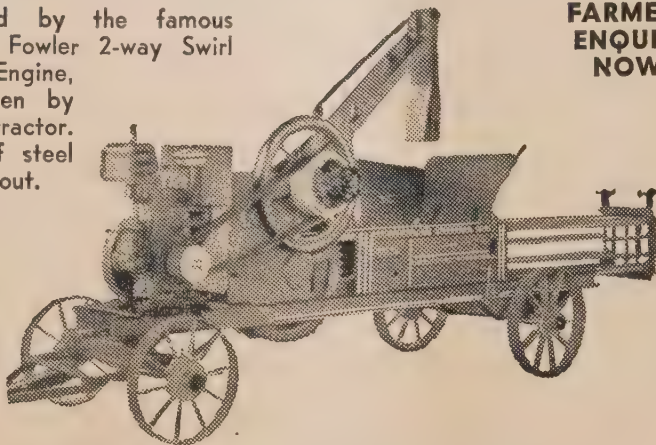
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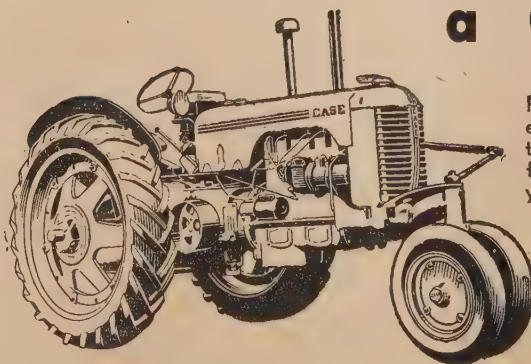
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Only in the urban areas like Nelson or Blenheim will be found clubs run on a business basis or organisations serving special interests, such as the Rotary Club, the Optimists, or the Society for the Prevention of Cruelty to Animals.

Country Library Service

The Country Library Service is a feature of rural life deserving special mention. This service is adapted to serve varying needs. Borough and town board libraries, such as that in Blenheim, having liaison with the Country Library Service and which provide a free service financed out of local rates, are entitled to loans of books from the service, the number of books being calculated on a population basis. This loan stock is exchanged regularly. Smaller townships with libraries not supported by rates, and which are therefore obliged to charge subscriptions for books loaned, are entitled to draw 50 books for every £3 paid to the service. These books are changed at the thrice-yearly visit of the Country Library Service van. With few exceptions, all but the smallest rural towns covered in this survey possess such subscription libraries.

For people in remote localities, not within 10 miles of a public library, the individual service is available. For the South Island books are sent out from the Christchurch depot. Only return postage is payable. Through this service a maximum of three books is sent out in the first place. One of these may be fiction but it must be fiction of a high standard. One book may be changed at a time. The hamper service has also been used for groups of a dozen or so people in remote areas, hampers of books being sent to an individual member who assumes the responsibilities of librarian for the group. Another important feature is the request service. Books or groups of books other than popular fiction are available by request either from the headquarters stock of the service or through other important lending or reference libraries in New Zealand. In practice, this means that if the requested publication is in New Zealand it will be supplied to wherever the request is made. This is magnificent service.

Differences in social activity brought about by variations in the nature of the prevalent farming activity are superimposed on differences caused by the size of town. It is natural that there should be greater variation in social organisation, as social activity is not subject to the same degree of compulsion as primary economic wants which are standard throughout the country. Somewhat naturally, also, the intensive farming districts appear to give birth to a more vigorous community life, as represented by social and sporting activities, than the more

sparsely-settled areas. At Riwaka, however, the extremely arduous nature of the work on the small holdings of the district interferes with leisure-time activities.

The presence or absence of a co-operative dairy factory is an important aspect of rural town life. Not only does such a factory tend to emphasise the common interest that farmers have in the progress of the district, but it appears to encourage the development of educational and social groupings—for example, Young Farmers' Clubs. An instance of that is the rather remarkable development of social life in



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The above is a reproduction of a poster issued by the Aid for Britain National Council.

the small township of Rai Valley, Marlborough, which in the township itself has an estimated population of about 60. As well as a branch of Federated Farmers, the co-operative directorate, a boys' and girls' agricultural club, an A. and P. show committee, the usual school committee, church committees, library, and sports club committees, there are branches of the Women's Division of Federated Farmers, the Women's Institute, W.E.A., R.S.A., Plunket Society and Red Cross Society, a Boy Scout troop, and a sewing circle. This list is not comprehensive and there may be other societies holding regular meetings in the township.

Brightwater in Nelson provides another illustration. There a remarkable outburst of local energy and enthusiasm over a period of years has resulted not only in a conveniently-situated post office and beautiful school grounds but also in a most ambitious scheme for the centralisation of the community's recreational and cultural activities. In an area of land adjoining the local hall, library, and cribbage club rooms there are

... SOCIAL AMENITIES

already tennis courts, well-kept bowling and croquet greens with attractive club houses, and sites for cricket and football fields, all creating an air of delightful intimacy. Plans are laid for an attractive frontage to the main road. Much of the work has been done with voluntary labour and some hundreds of pounds raised by local effort. This spirit is worthy of Lord Rutherford.

Public Utilities

Among public utilities it would be difficult to over-estimate the importance of the reticulation of electrical power. Without the easing of burdens and the efficient lighting made possible by electricity, literary activity and cultural life are greatly handicapped. Of the districts without power—about one quarter of the 35 towns included in the survey—it is again the dairying districts which have made the most energetic efforts to meet the situation. Many of the farmers and some of the more important buildings have their own electricity plants run by diesel motors; Karamea, Inangahua, and Rai Valley are cases in point. Apart from the reticulation of electricity, none of the smallest country towns has any other public utilities and even the larger towns have little else. The absence of a public water supply must seriously deter the establishment of rural industry. Apparently only Picton, Kaikoura, and Reefton have public water supplies.

Taken in conjunction with the absence of garbage collection and sewerage, the absence of footpaths except in shopping areas of the larger towns, and then sometimes rough and unsealed, and the absence of continuous local dental or medical attention, that means that country dwellers miss some of the refinements of living available to residents of urban areas.

Roading also deserves mention. Compared with those of the far north which lack metal, the roads of Nelson and Marlborough are in a fair state of repair, especially considering the high rainfall of the west coast. However, there are some rather badly-corrugated stretches, summer dust is a nuisance, and many of the feeder roads are narrow, steep, tortuous, and dangerous. Roads are the arteries of country districts; bad roads reduce communal vitality.

A huge amount of socially-desirable development work awaits attention in country districts, and there need be no worry for some time about a sufficient scope in public works to take up any slack in the use of labour and resources caused by a recession in economic activity.

COAL COUNTRY



The bleakness and isolation of Denniston (above and top of opposite page), perched on the Mount Rochfort plateau.



The road to Denniston (above) and the "Burma Road" from Granity to Millerton (right) illustrate the difficult access to some of the coal-mining townships of the West Coast.



HOUSING IN NELSON AND MARLBOROUGH



Types of Housing

There is a temptation to discuss houses and buildings in terms of some of the west coast mining towns, a temptation which must be resisted if a representative picture of predominantly rural towns is desired. For no rural towns are typified by that most depressing of mining settlements shut in by mountains and having only one rough and narrow track for wheeled traffic. Here the small, rusty, iron shacks are dumped closely together on the solid, damp, inhospitable rock with no privacy and, of course, no vestige of a garden, which would be made impossible anyhow by the bleakness of the climate; this basin in the mountains is 2000 feet above sea level and sometimes for weeks on end is shrouded by continuous rain or mist. When the sun is not hidden by such conditions there should be the possibility of several hours' sunshine in the middle of the day in summer; otherwise the mountains would shut it out. Until the future economy of the west coast is more clearly determined it is difficult to suggest what action should be taken about places like this, except to encourage the movement which has already started of shifting homes down to the more congenial flats and dismantling the shacks already abandoned.

For factual information covering the 35 towns included in the survey the age and appearance of all houses and the materials used in construction were

tabulated. The outstanding feature is the marked periodicity of design.

The overwhelming majority of houses are of wooden construction; not more than 5 per cent. are of other materials, mostly iron, followed by plaster, brick, and concrete in that order. The choice of this less durable material has some advantage from a national point of view because, as replacement and renovation are carried out more quickly, internal design is more likely to keep up with advances made in this field. Not all houses are

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as well built or as well preserved as the Kemp home at Kerikeri, which dates from the 1820's.

The data suggest that about 1800 of the 3000 houses tabulated were built before 1914-18 and the remainder since. An additional 300 remained unclassified, either because they were transitional types which resisted classification or, more rarely, because they were more in the nature of shacks than homes. Of the 1800, about 1400 appear to have been built before 1900. Of the 1200 built since the First World War only 200 have been built since about 1930, the start of the depression, and in eight townships no homes have been built since that date.

Those figures could mean either that the rate of growth of rural population (not the rural birth-rate) is slackening or that building is not keeping pace with demand. The first proposition,

because of the urban drift, is nearer the truth, though in some cases, particularly in the larger country towns, housing is at a premium and considerable housing construction is under way; Motueka, Picton, and Kaikoura are cases in point. Housing statistics indicate that Richmond is also developing rapidly residentially, but not commercially because of its proximity to Nelson. Murchison is at least holding its own, and Reefton, with the development of new mining areas in the vicinity, appears to be going through a period of resuscitation.

Of the larger country townships, Mapua (with the lime and chemical works, harbour facilities, and seaside cottages) has shown the most marked progress, with Inangahua Junction (the Railways, and Public Works Department camp) also showing signs of development. Other townships which have progressed within recent years are Rai Valley (dairying) and Ika-matua (gold dredging, sawmilling, and dairying).

Of economically-undeveloped towns of the smallest type, Stoke is rapidly becoming a suburb of Nelson, but genuine country towns like Tapawera (with a district high school) and Waimangaroa (a mining town gaining at the expense of Denniston and Burnett's Face, which are unfavourably situated in the hills) are showing signs of progress in their own modest ways. Some of these towns may now have reached their immediate peak.

On the evidence it seems that country towns have not suffered from depopulation as much as outlying areas, and that, just as the

DEVELOPMENT OF HOUSING . . .

urban areas have grown more quickly than the larger country towns, so the larger of these country towns have grown more quickly than the smaller, which have often stagnated.

Part of the evidence lies in the number of unoccupied houses. In the townships visited only about 60 houses were obviously vacant, including only one or two built after 1900. As there are always casualties caused by unsuitability or the circumstances of ownership, that certainly does not suggest any great economic decline of rural towns, even if since the depression the number of people to a house has fallen. For example, Havelock shows a modest population decrease since 1936, but there is little sign of vacant houses.

Evidence of Past Conditions

Housing is interesting in other ways, for it can suggest much about economic conditions in the past. In



Type I.

particular, the size and substance of housing is likely to be influenced by interest rates and by the price and elasticity of supply of construction materials. Tabulation shows that the most popular early-period house was type I with type II displacing it in the last quarter of the 19th century and the substantial type III displacing II immediately before the First World War.

That the gold discoveries, the expanding pastoral industry, and the immigration boom of the 1860's and 1870's did not result in anything more elaborate than the simple type of dwelling typified by I can be explained largely by the dearth of capital in the immature economy, accompanied by high interest rates on loans and investments. Even the Provincial Councils had to borrow at effective rates of upward of 8 per cent., and 12



Type II.

per cent., the ruling rate of interest in Japan today, would not have been uncommon. From 1875 to 1895 rates of interest, as revealed by bank discount, fluctuated within the limits of 7 and 9 per cent. and vast improvements in transport must have greatly



Type III.

increased the supply and reduced the price of building materials, resulting in a larger style of house, despite depression, falling prices, and some unemployment.

From 1895 on there was a sharp fall in the rate of interest and the ruling bank rate until the First World War was 5 per cent. With the advent of Government Advances to Settlers the long-term interest rate fell to between 4½ and 5 per cent., which in conjunction with extremely-favourable prices for New Zealand exports as against a lower internal price structure, resulted in a favourable supply of capital goods and made possible the popularity of the type III dwelling—easily the largest and most handsome and serviceable of period homes. That was the golden age of New Zealand development.

That the post-war period did not result in an advance on that style, despite a substantial accumulation of funds as a result of wartime prosperity, can again be explained in terms of the



Type IV.

high interest rates characteristic of those years. The war had destroyed much real capital, inventions had increased the demand for industrial capital, prices had risen, and the war had created conditions of political and economic insecurity. Interest rates rose to 6 and 7 per cent. for most mortgages, and the type IV houses of the 1920's are rather smaller and less impressive than the pre-war variety. Only in the past few years have interest rates fallen to the low levels of 35 years ago. The unemployment and distress of the depression, the unfavourable movement in the terms of trade, and the cessation of overseas borrowing after the First World War brought con-

structional and building activity almost to a standstill from 1930 to 1935.

With falling interest rates and an increasing tide of imports after 1936 building activity was again resumed, but those years brought no noticeable tendency toward increasing size (types V and VI), for there was much leeway to make up. With the increasing difficulty of obtaining timber and its substitution by more permanent materials, the decreasing size of families and the difficulty of obtaining domestic help, and the competition of new items for consumers' funds, it is not surprising that homes were outwardly unpretentious. Of more recent years wartime restrictions have reduced building programmes and obscured the trend in construction, but the marked desire to carry out alterations and additions may reflect low interest rates.

Business and Public Buildings

The variety of designs and materials in any one business or public building



Type V.

defies attempts at classification. The sprawling nature of shopping areas often seems to serve little useful purpose and, with the weird forms of architecture displayed, often creates a scene of confusion displeasing to the eye. There is a strong case for the zoning of shopping areas, as there is for some direction on design, or even pre-erection of premises by the local authority for lease to private business.

In general, though some townships have depressing buildings and equally-depressing houses, there is not the expanse of dilapidated living conditions found just outside the business areas of the great cities, representing the remains of the older residential sections. However, some of the west coast towns in particular more than make up in "quality" what they lack in quantity.



Type VI.

Use of Valuable Land

An outstanding impression remaining from this tour was the very limited area of high-class land capable of intensive cultivation, as well as the extremely-wasteful use that has been made of large tracts of hill country in both high- and low-rainfall areas.

In the interests of the immediate development of a country, it may be in order to export soil fertility and other national resources in exchange for overseas funds to finance capital development requiring an inflow of immigrants and imports. That would bring about a movement toward equilibrium with those more-densely-settled countries most closely connected by trade and immigration in the relation between natural resources (unimproved values), capital improvements, and labour.

The great dangers which this survey brings home are that the destruction of natural resources may become cumulative and difficult to control, and that the store of fertility or stands of timber may be frittered away on current consumption to an excessive degree as an easy road to the temporary maintenance of high living standards. Then their destruction involves ugliness and a negative attitude toward the national heritage. The rate of use of natural resources and its implications for future living standards, full employment policies or no, should never be overlooked. Nor should the drain that cities make on soil fertility.

Extensive burning seems to be an accepted feature of farm management on the Waimea hill country, and in times of drought the rolling country to the east and south of Blenheim is burnt dry by the sun and eaten almost bare by stock. The argument may be advanced that such burning and stocking of the land is forced on the occupier by lack of available capital resources or other economic necessity. In either case it is a position which cannot continue, merely on the basis of physical facts. Readjustments necessary on the economic side are by no means obvious, but it is something to recognise the mere existence of a problem.

Equally important is the spread of urban development over highly-productive land. It is logical that close settlement on fertile soils should provide the basis for the development of towns such as Motueka, but the thoughts prompted by the spread of the same town over the Motueka Valley (9) raise the question of land use on a national scale. With an expanding population, how far is it

(9) The same applies to other small towns such as Stoke or Richmond equally with cities, such as Auckland, which is spreading over farming land to the south, or Wellington, with the Hutt Valley already committed to building.

USAGE OF RURAL LAND



[Neville R. Lewers photo.]

The farm lands of the west coast must be won from the forest.

possible to reconcile the use of good land for residential areas with a cheap and abundant supply of fresh fruits and vegetables or with near contact with natural scenery? Arguing on general principles, the situation is likely to develop on the following lines:

If the object in residential building is detached dwellings with from an eighth to half an acre of land round each home, as the available land becomes scarcer land rents will rise, and at the same time commercial market gardeners, orchardists, and tobacco growers will tend to be driven on to poorer or more remote land, or total production will decline. The real costs of production of these crops will rise. It is quite clear that this rise in costs of production is part of the cost to the community of taking over the land in question, yet the person, local authority, or Government Department buying the land does not have to meet this cost as an addition to the initial purchase price of the land. A further consequence of the desire for detached dwellings is the sprawl of country towns, but more particularly of cities, over vast areas. Consequently it becomes increasingly difficult for those living in the inner areas of the city

to reach or look out on trees, rivers, grass, or sky, and the residential value of such areas declines. Everyone is familiar with these poor relics of once-fashionable suburbs in the confines of large cities. Only competition from business or the increasing strain on the cities' transport systems could keep rents up in such areas. And again there is a social cost of which no account is taken in planning extension of the boundaries of the town.

To meet some of these difficulties decentralisation of industry into rural areas has been much talked of. In some ways it would mean a more healthy environment for workers, but in present circumstances rural industry can operate most efficiently only in the densely-settled rural areas and near the larger country towns; it would still tend to absorb high-class farming land. At least three additional measures separately or in conjunction appear to be indicated:

First, it will be necessary to prepare suitable areas for more intensive farming than is at present carried on to meet the demand by a growing population for crops, the production of which is interfered with by the spread of urban areas. Such steps as

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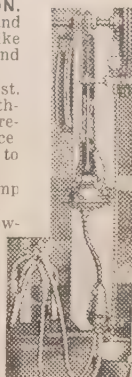
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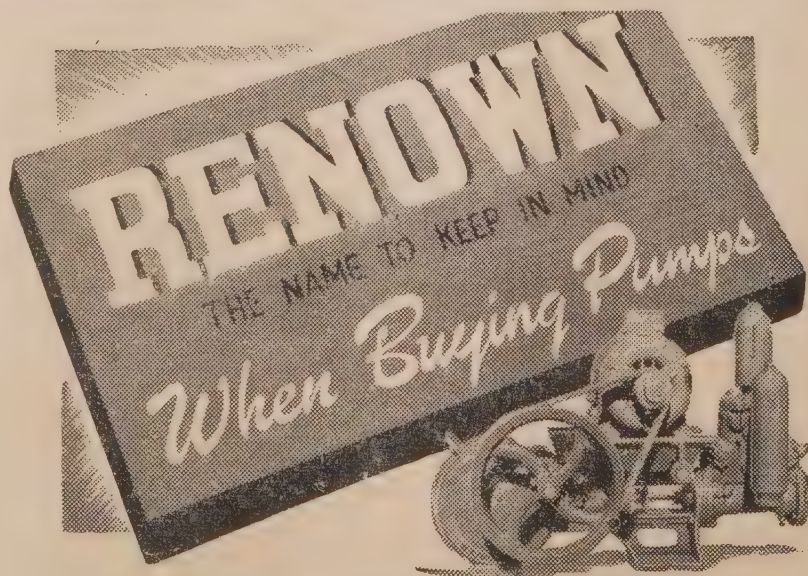
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RURAL NELSON AND MARLBOROUGH



[Neville R. Lowers photo.]

Rugged country encircles the small mining and farming township of Seddon.

the irrigation of the Waimea would appear to be indicated.

Second, an attempt can be made to restrict urban development to land less suited to agriculture but which will respond quite well to the intensive, labour-wasteful methods of the home gardener. In that respect Dunedin and Wellington are well situated, especially as green belts occupy the higher slopes of the surrounding hills. The outlying suburbs, separated geographically from the central city area by, for example, ranges of hills, seem to have a better chance of developing an atmosphere of partial independence and solidarity favourable to local community activities. The Wellington suburb of Karori is a case in point, and Lower Hutt is a city in its own right.

Third, attention will have to be directed toward multiple units for shops and houses. When interspersed with open spaces, green belts, and recreation areas, such units can be made quite attractive in their settings and appear, at least externally, infinitely superior to dingy, huddled dwelling units of grotesque design.

In one or other of these ways the problem will have to be met. There is no sidestepping the dilemmas created by a limited land

surface and an extremely-limited area of highly-fertile arable land, in competition for which all residents and farmers, foresters, manufacturers, workers, traders, professional men, and religious, educational, cultural, and sporting interests meet on common ground. Moreover, everyone has an overriding interest in the preservation of what may be called the natural amenities of the countryside and their easy availability for all. This problem is more than one for local authorities; it is a national problem, and it calls for an appropriate permanent national council empowered to investigate and supervise land use as a whole, both urban and rural, and on a national scale.

For example, in the author's opinion it would be tragic if the beautiful valley and hills of Makara became a congested area. The loss of this recreational (in the proper sense of the abused word) and educational background to western Wellington would be irreparable. The farming covers town milk supply, fat stock, supplementary cropping for these, and pastoral farming.

Such a commission would be required to consider all factors affecting land use, including the location of industry. The provision of building and shopping sites, transport facilities, water, gas, and electricity, and pricing policy for the use of these sites and public utilities can help direct the flow of settlement. State housing, of course, is also a powerful directive. The nucleus of such an authority already exists in the Soil Conservation and Rivers Control Council.

Future of West Coast

This survey cannot conclude without some reference to the future of the west coast. There is scope for ex-

pansion, even if of unspectacular dimensions, in the dairying industry, but the main hopes for the future appear at the moment to be in building up forestry activities, the production of forest products, and the tourist trade.

High up on the list of attractions is the beautiful journey from Seddonville to Karama, provided the weather is kind. This little-known part of New Zealand would become better known if it were roaded from Collingwood via the Heaphy track, but possibly the results would not all be gain. Much of the present attraction of a place like Collingwood lies in its remoteness from the distractions and tourists of outside society, and is it not doubtful if the unsurpassed friendliness of Collingwood residents could withstand the rush of irreverent tourists accompanying any link-up with the West Coast roads?

Acknowledgments

The co-operation of many people in providing information about their own districts was one of the most gratifying aspects of the tour. In particular, acknowledgment is made of the help given by the following: Mr. A. M. Hale, Blenheim; Mr. W. J. Jamieson, Collingwood; Mr. J. Stewart, formerly of Redwood's Valley, now of Nelson; Mr. H. D. Bennett, Motueka; Mr. J. P. Cottier, Takaka; Mr. J. A. Esson, Rai Valley; Mr. H. B. Everett, Riwaka; Mrs. Heine, Upper Moutere; Mr. T. J. McKee, Mapua; Mr. W. Max, Brightwater; Mr. B. Mirfin, Ikamatua; Mr. B. Spiers and Mr. J. Greig, Murchison; Mr. A. O. Stanley, Reefton; Mr. R. B. Wells, Waimangaroa; and the staff of Tapawera District High School.

The author also wishes to acknowledge help given by the National Employment and Country Library Services.

Pig Broadcasts

UNDER the auspices of District Pig Councils broadcasts will be delivered in March as under:—

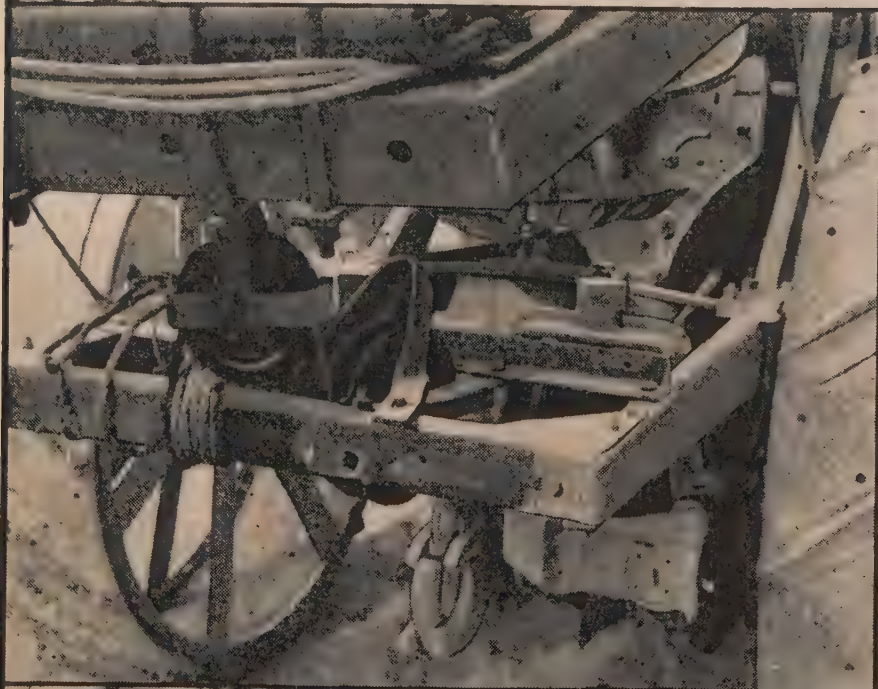
Auckland—1YA, on March 23, at 12.35 p.m., "Mating and Production Plan for Pigs on the Dairy Farm," by H. E. Clark, Supervisor, Auckland District Pig Council.

Wellington—2YA, on March 18, at 12.35 p.m., "A Chat with the Vet.," by I. H. Owtram, Supervisor, Taranaki District Pig Council.

Home-constructed Mechanical Loader



The loader at work filling the scoop with rock to be dumped in the truck alongside. The beam is strengthened by the tie rods above it. The machine has proved itself in 14 months of work, during which only 15s. has been spent in repairs.



A rear view with the beam in the "down" position. The counterbalance of railway iron is on top of the beam. The cable is led from the chassis through the beam pulley, thence through the guide pulley, to the winch. The driver's seat can be seen just below the corner of the beam.



A front view, showing how power is transmitted from the end of the shaft by chain and sprockets to a side shaft running to the rear of the tractor. The simple clutch is toward the rear of the side shaft, the front of which is used for hand cranking the engine.

Solves Labour Problem in Lime Quarry

By P. S. SYME, *Instructor in Agriculture, Warkworth.*

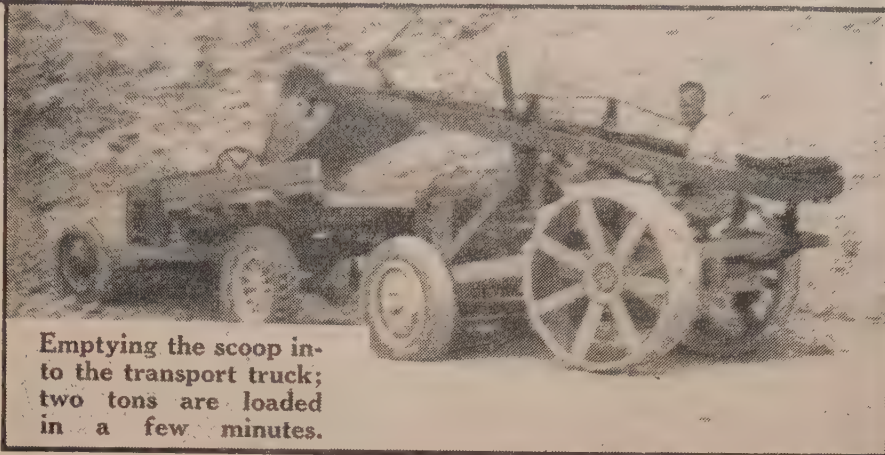
IN times of full employment labour is commonly hard to obtain even where the work is relatively easy and working conditions are good. Where the work can be particularly arduous, as in a lime quarry, and where, to make conditions even less attractive, adequate housing is lacking, it is not surprising that positions are often advertised in vain. This article describes how two partners in a small limeworks solved a critical labour problem. Though the construction of a loader such as that described may appear a formidable task, plenty of mechanically-minded young men in New Zealand are capable of accomplishing it.

SUCH was the labour situation that Messrs. Durey and Martin decided that they must either close down their limeworks in the Albany district, Auckland, or mechanise their equipment. But mechanisation demands money, and the high cost of mechanical loading equipment, even had it been readily available, would almost have put the firm out of business. Their only solution appeared to lie in constructing for themselves a machine which would not be too elaborate or costly but which would be capable of doing the work. Fortunately, the two partners are ingenious men with a strong mechanical bent, and the problem of constructing from scrap a mechanical loader which would substitute for a £3000 machine left them undaunted. How well they have succeeded may be seen by a visit to their limeworks.

Old Tractor and Scrap

The basis of the loader finally decided on was an old Fordson tractor. That was supplemented by two old truck chassis and two old Ford car chassis obtained from the junkyard at scrap-iron prices.

The loader consists essentially of a rigid girder-frame beam with a scoop at one end and a pulley at the other. This beam is pivoted on a strong bridge above the tractor, the bridge being welded to a kind of auxiliary chassis frame. Power is transmitted by a sprocket on the front end of the crankshaft through a chain to a shaft connected by a clutch to a worm-



Emptying the scoop into the transport truck; two tons are loaded in a few minutes.

driven winch bolted to the differential casing. A wire cable from the winch is led through a guide pulley and in over the pulley at the end of the beam, the end being attached to the chassis frame immediately beneath. As the winch revolves it pulls down the pulley end of the beam and so raises the scoop.

The whole of the auxiliary chassis, the bridge fulcrum, and its strong reinforcing brackets, as well as the beam itself, were constructed from the old truck and car chassis. The clutch for operating the winch consists of an old Chevrolet clutch lining between two flat iron plates. It is very easily operated and has proved both trouble free and efficient.

The scoop, which holds one-third of a yard, is self balancing and recovers its working position after being tipped. It is controlled by a manually-operated slip-catch from the driver's seat and is almost completely automatic. To counterbalance the weight of the scoop a short section of railway iron is clamped to the opposite end of the beam.

Rugged Construction

The whole job has been ruggedly constructed and is designed to withstand rough treatment and hard work. The beam is strongly reinforced by specially-designed tie rods and is capable of withstanding the severest strains likely to be imposed even when working under the most adverse conditions. The fulcrum bridge which carries the whole weight of the load and the corresponding strain on the cable is supported on robust brackets welded to the auxiliary chassis. The front axle of the tractor, which of course was not designed for this type of work, was reinforced with an axle taken from an old Reo truck.

Apart from the scoop, which was professionally made, all the construction work was performed on the spot by the two men with the aid of a

home-welding outfit. The total cost of all the material, including scoop and winch, did not exceed £70 and the work required only about six weeks of spare time.

Performance

The machine has now been in constant use for well over a year and its performance during that period has exceeded the highest expectations. On the day before the job was completed the two quarrymen secured work elsewhere and suddenly left. There seemed little hope of being able to replace them and the position appeared desperate. Everything depended on the new machine.

Beginning work the following morning, the partners hoped for no more than to get out enough stone to keep the works going. To their great relief the machine performed magnificently and by mid-afternoon it had loaded more stone than three quarrymen had been able to load in a day. It has maintained this record ever since, and beyond an occasional new pulley cable has needed little repairs.

The operator uses the machine to load the limestone into a two-ton truck, in which he transports the stone about 100 yards to the crusher. It was found that two tons of limestone could be loaded and carted in six minutes, a speed far beyond the capacity of the crusher. In normal work 40 tons is easily handled in a day by one man and no other help is needed to run the quarry.

Economy of Operation

Apart from its low cost and overhead charges, the machine is very economical to work, consuming no more than three gallons of fuel in a working day. Even if good labour were again readily available, oil fuel provides cheaper and more efficient power than human muscle. Moreover, the machine does not resent drudgery.

EFFECT OF RABBIT NUISANCE AMENDMENT ACT

THE Rabbit Nuisance Amendment Act, 1947, which came into force on November 25, makes important changes in the law governing the control of the rabbit pest by Rabbit Boards.

FIRST, the amending Act sets up a Rabbit Destruction Council as an advisory body to the Minister of Agriculture. The council is to consist of eight members to be appointed by the Governor-General for a term of five years—two nominees of the North Island Rabbit Boards Association, three nominees of the South Island Rabbit Boards Association, and three other members. The functions of the council are:—

To investigate the extent of the rabbit pest in New Zealand.

To devise and promote measures of destruction and control of the pest.

To co-ordinate, guide, and supervise the activities of Rabbit Boards.

To make recommendations to the Minister on those subjects, on the constitution, alteration, amalgamation, or abolition of rabbit districts, and on other matters specifically mentioned in the Act.

Grants to Rabbit Boards

Second, grants from Government funds may be made available to Rabbit Boards in need of financial assistance to combat the pest in their districts. Grants are to be made on the recommendation of the Rabbit Destruction Council. In making recommendations the council must consider the extent to which a rabbit district is infested or in danger of being infested with rabbits, the financial position of the board concerned, and other relevant matters.

The grants are to be met out of the proceeds of a levy on rabbit skins produced and sold in New Zealand. To the extent that the proceeds of the levy are insufficient to cover all sums granted, the additional amount will be borne by the Government. This provision is additional to the existing financial provision for Government subsidy on rates levied by Rabbit Boards for general revenue purposes.

Levy on Skins

Third, the Act provides for the imposition of a levy on all rabbit skins produced and sold in New Zealand. The rates of the levy and the period for which it is payable are questions for determination by the Minister after taking into account the recommendations of the council. Different rates may be fixed for different classes of skins, and any rate may be fixed as a percentage of the purchase price of the skins or in such other manner as the Minister determines. Notice of any rate fixed and the period for which it is payable must be gazetted. The method of payment and collection of the levy, the persons liable for the levy, and the general machinery of collection are to be laid down in regulations made under the Act.

The directions in which the proceeds of the levy shall be expended are:—

Radio Broadcasts

RADIO talks to farmers will be given from Station 1YA Auckland at 7.15 p.m. on the following dates:—

March 15—"The Fertiliser Position," by J. W. Woodcock, Acting Director, Fields Division, Wellington.

March 22—Young Farmers' Clubs session, by J. Barclay, Dominion president, Federation of Young Farmers' Clubs.

Farm news sessions are broadcast over main national stations every Thursday at 9.20 p.m.

In payment of the cost of collection.

In payment of the expenses of the council carrying out its functions, including salaries of officers and fees and travelling expenses of members of the council.

In repayment of advances to the council for preliminary expenses.

In reimbursement of grants from Government funds to Rabbit Boards.

"Killer" Policy Emphasised

Fourth, an important change is made in the principal functions of a Rabbit Board. Whereas under the principal Act the primary function of a Rabbit Board was to administer Part I of the Act, Section 15 of the amending Act declares that the principal function shall be to do all things necessary to destroy rabbits. In other words, emphasis is placed on the institution of a rabbit destruction or "killer" policy instead of merely a policy of inspection and administration under Part I of the principal Act.

As most boards have adopted a "killer" policy, the change in the principal functions of a board can be considered as an alteration of the law to accord with the general practice of Rabbit Boards. In consequence of this change in the law, those few boards which now administer the Act on the basis of compelling individual owners to destroy rabbits in accordance with the provisions of Part I of the principal Act will not be allowed to continue to function on that basis after April 1, 1949, except with the consent of the Minister given on the recommendation of the Rabbit Destruction Council. In the meantime, it will be the function of the council to investigate the position of each board concerned to decide whether satisfactory control of the pest is being maintained in its district and whether, in all the circumstances, the board should be permitted to continue to operate on an inspection policy basis.

Complementary to the change in the principal functions of a board is the provision in Section 24 of the amending Act to ensure that a board carries out its functions effectively.

Section 24 states that if the Rabbit Destruction Council finds that a board, by an unreasonable failure or refusal to exercise its powers, is not properly carrying out the destruction of rabbits or taking effective measures to control the rabbit nuisance in the district, the council may recommend to the Minister the removal of the elective members of the board. If the recommendation is approved, the elective members may be removed from office by the Governor-General and other fit persons may be appointed in their place.

Power to Alter Boundaries

Fifth, the amending Act in Section 29 confers power to constitute a new district, extend the boundaries of an existing district, or amalgamate two or more districts without recourse to the procedure for constitution, extension, or amalgamation provided by the principal Act. In other words, Section 29 provides for the compulsory formation of new rabbit districts, the extension of existing districts, or the amalgamation of two or more districts without a petition, consent, application, or request from the ratepayers concerned or the board of a district. However, such powers are exercisable only on the recommendation of the Rabbit Destruction Council approved by the Local Government Commission and by the Minister.

Where any new district is formed under this section the first elective members of the board may be appointed by the Governor-General at the request of the Minister on the recommendation of the council.

Limit on Subsidy Removed

Sixth, the amending Act removes as from April 1, 1948, the former limit on the subsidy payable on rates levied by Rabbit Boards for their general revenues. In consequence of this alteration Rabbit Boards will be entitled to a £1 for £1 subsidy on all rates levied within the limits of their rating powers and collected within three months after the close of the financial year in respect of which the rates were made and levied. The amended provision will give a means by which additional financial assistance will be available to boards the financial position of which should be strengthened and which are prepared to rate their ratepayers at a figure exceeding the former maximum subsidy.

The statute also contains a number of amendments to the principal Act, some of which remove defects found to exist in that Act, while others are designed to improve the administrative machinery for the effective operation of the Act in districts under the control of Rabbit Boards.

MACROCARPA POISONING IN DAIRY HERD

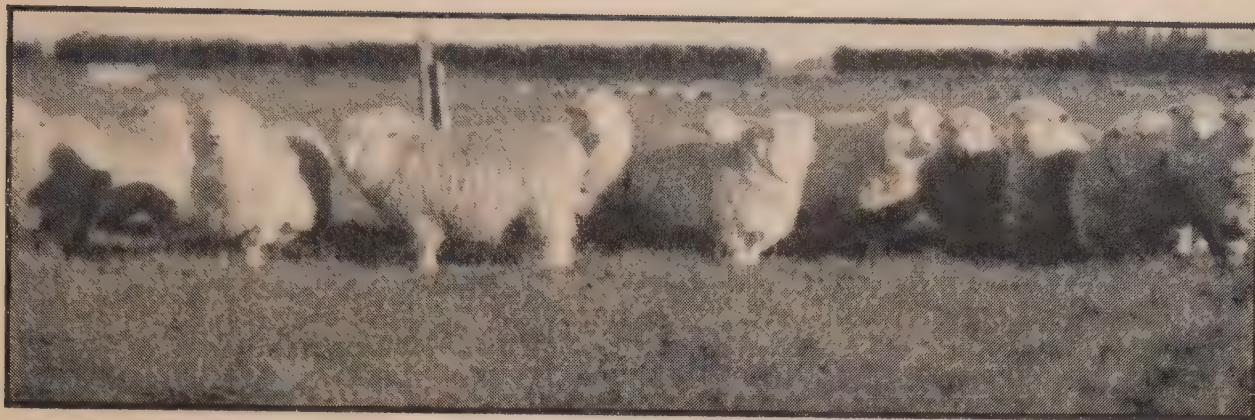
Abortions and Deaths Follow Eating of Green Branches

A CASE in which of a herd of 23 dairy cows which ate the flowering heads of macrocarpa branches seven aborted and one cow and one heifer died is reported by A. M. MacLeod, Assistant Inspector of Stock, Takaka. As trouble has previously been reported as the result of stock eating macrocarpa foliage, and many of these trees are still being felled for timber where the branches are accessible to grazing stock, repetition of the warning of the danger presented seems unfortunate.

The herd in which the recent trouble was reported were running in the paddock where the trees were felled and although other feed, including hay, was in fair supply, the animals ate the macrocarpa branches, especially the flowering heads, freely for several days.

It was June and all the cows were in calf. The first to show symptoms was a heifer which became listless, staggered when it walked, and whose eyes became sunken. Of the whole herd seven aborted, and of these one cow and one heifer died. Eight others showed signs of springing and then returned to normal. The remainder were listless and gave very little milk for some time after calving, but afterward recovered their normal health.

On another farm in the district six calves, all about six weeks old, gained access to some macrocarpa branches which had been piled in a heap ready for burning. Although other feed was available, the calves ate the branches and within two days three of them had lost all their condition, their eyes became sunken, and they died.



FLOCK MANAGEMENT CAN INFLUENCE LAMBING PERCENTAGES

By A. D. M. G. LAING, *Veterinarian, Department of Agriculture, Hastings.*

AS man, by selective breeding, has brought into being types of animal which differ greatly from the original forms evolved under natural or "wild" surroundings, special adaptive measures are necessary in all forms of stock farming, and the more intensive and highly developed the farming, the greater the need for such measures and the greater the production which results. This applies to sheep-farming in common with other types of farming, and this article discusses factors in the breeding of sheep which can affect the percentage of lambs conceived.

ONCE the ewe has conceived, other factors influence the percentage of living lambs born and others the number of lambs brought to maturity, but these do not come within the purview of the present article.

As the factors mentioned above cover both the ewe and the ram, a short summary of the breeding mechanism of each follows:—

The Ewe

Normally 1, 2, or 3 eggs (ova) are produced from the ewe's ovaries during the oestrus or "heat" period. These eggs, which form anywhere on the surface of the ovary and are about 1/130in. in diameter, break loose from the ovary and by some method not yet ascertained find their way to the small opening at the end of the horn of the womb and thence pass down the upper part of the horns of the womb (the Fallopian tubes). If more than one egg is produced, each ovary has functioned, but if single eggs only come, the ovaries function on alternate periods. It is considered that it is in the region of the Fallopian tube that the egg is fertilised by male spermatozoa. If all goes well each egg so fertilised grows into a lamb.

The oestrus, or heat period, the time at which the ewe is willing to mate, comes on at average intervals of 17 days in New Zealand, with common variations of from 15 to 19 days. Heat lasts on an average about 30 hours, and in the ewe the external signs are

very slight; for practical purposes the only indication is willingness to stand to the ram. During the spring and early summer ewes do not come into season, but during the rest of the year the oestral cycle carries on.

Though willingness to take the ram, or heat, is important, ovulation (the production of an egg), the physiological process of which it is the precursor, is even more important. Research workers appear to consider that ovulation takes place toward the end of heat, about the 24th hour on an average. At a very vague approximation the egg takes from 4 to 10 hours to reach the womb where it can be fertilised, and if it is not fertilised within a few hours it dies.

It is also thought that male spermatozoa take about 6 hours to travel to where fertilisation of the egg takes place in the Fallopian tubes of the womb, and that their life from the time of mating is up to about 30 hours, though after the 12th hour most of the several million produced at each mating are dead.

The Ram

Compared with the 1, 2, or 3 eggs normally shed by the ewe, the ram produces several million sperms, any of which can fertilise an egg.

It is considered that a certain seasonal "flushing" of rams occurs during the autumn, the normal breeding season for sheep. The condition is

recognisable by the skin becoming highly coloured, particularly on the purse and the inside of the thighs.

Male spermatazoa may be received at any time during the heat period, but as they take about 6 hours to reach the egg and the majority die before 12 and at most 30 hours, service toward the end of heat obviously has the best chance of success. The ewe will not generally accept service after her heat period is over, and the unfertilised egg dies very quickly. Vigour in the ram is therefore important, as it ensures as far as possible service late in the heat period.

The problem of increasing the conception rate in the ewe may therefore be tackled by ensuring that every ewe produces as many eggs as possible; by having the rams in suitably vigorous condition for mating, and by general management methods on sound lines to enable the rams to work as satisfactorily as possible during mating.

Factors Affecting Ewes

Considerable research work has been done on the flushing of ewes, and it has long been recognised that it has a beneficial effect on lambing percentages. In an experiment in Australia 700 ewes were divided into two flocks, each of 350, as follows:—

"A" flock were put on restricted grazing to bring down their condition and then flushed on to good dry oat and pea stubble for four weeks before mating, on which they rapidly gained weight.

"B" flock were kept on dry grazing, which maintained their weight till mating time, but on which they lost condition during mating.

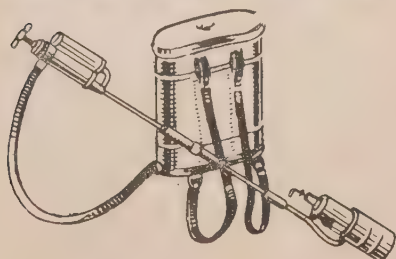
Lambing results were:—

"A" flock (flushed) 109.4 per cent. lambs reared, with 18 per cent. twins.

Photograph in heading by Barwell Studios, Ashburton.

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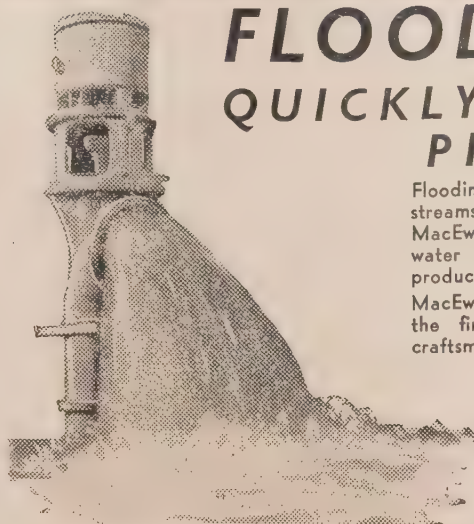
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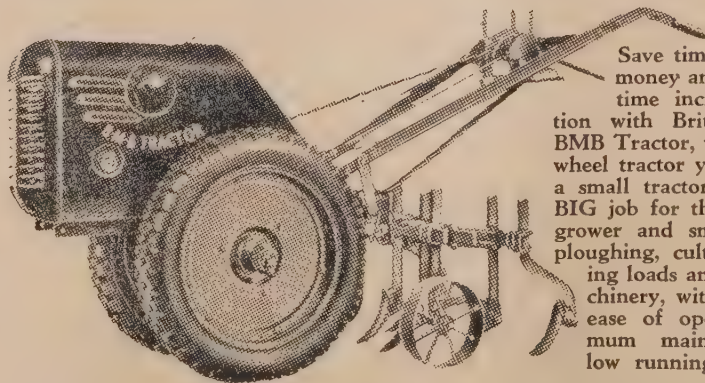
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"B" flock (unflushed) 91.1 per cent. lambs reared, with 2 per cent. twins.

Similar experiments in other parts of the world have given similar results. It is, however, definite that flushing is not "fattening." It has been defined as "an approximate gain of 5 to 10lb. per ewe over a period of three weeks just before mating, from relatively poor condition."

It is of the utmost importance that sheep farmers should appreciate that putting high-conditioned ewes on to special feed is not flushing, and may indeed quite possibly defeat the object aimed at.

It is, in fact, fairly generally recognised that excessive fat is one factor in sterility, and some research workers have suggested that one reason for this is that when there is a big accumulation of abdominal fat (commonly covering the ovaries) it is more difficult for the egg when it breaks away from the ovary to get to the opening through which it enters the womb.

In view of the autumn grazing conditions which can occur in many sheep-farming areas in New Zealand, when in certain seasons a wet summer has resulted in excess pasture growth, this last point cannot be over-emphasised, and it is suggested that the wisdom in such conditions of shutting up some paddocks as reserve feed or for hay or silage and keeping the ewes in good hard condition is self-evident. This is quite apart from the value which such surplus feed may have later in the winter.

It has been found that injections of certain glandular preparations (anterior pituitary substance) can increase the numbers of eggs shed by the ewe at the heat period very greatly, 7 and 8 and more being common. As it is considered that feed conditions probably influence the amount of this glandular substance normally present in the blood, the value of flushing is evident.

If it is wished to flush the ewe flock, therefore, it is desirable to avoid for a substantial period before tupping time feed conditions that may lead to the formation of excess fat. Two to 4 weeks before tupping time flushing may be commenced. Short, sweet, good-quality pasture which has been free from sheep for at least a month is ideal.

If autumn conditions have been hard, lucerne is good, provided common-sense rules about "breaking in" to a change in feed slowly over a few days are observed.

Artificial feed supplements which have been found of value for flushing ewes include $\frac{1}{2}$ to $\frac{3}{4}$ lb. of grain (oats, maize, etc.) per ewe per day.

It has been shown that rape, turnips, and kale give substantial weight gains when fed during February, March, and April, and where conditions justify it

... FACTORS AFFECTING LAMBING PERCENTAGES

the use of these crops for flushing is worth consideration. Those interested are recommended to read the article by J. E. V. Simpson, Officer-in-Charge, Department of Agriculture Research Station, Manutuke, on page 350 of "The New Zealand Journal of Agriculture" for October, 1947.

As it is better for the two-tooth ewe to have a single lamb, flushing is not recommended for two-tooths.

Factors Affecting Rams

Rams should be purchased only from reliable sources.

Rams should be in good condition before mating, but with no excessive fat. Particular care must be taken that they are free from foot-rot or foot abscesses. Wool should be trimmed away from round the sheath before the rams are put out with the ewes.

During the period when the ewes are being flushed before mating it is sound practice to exercise the rams on hard ground if possible. Some effort at control of rams which fight should be made by shifting them around.

General Management Methods

Particular attention to some points in general flock management will be reflected in improved breeding results.

If farm conditions permit, it is best to run the ewes in mobs of about 250. Two-tooth ewes should be run separately, and it is definitely desirable that mature rams only should run with them.

The usual ratio of rams to ewes in New Zealand, hand serving apart, appears to be about 35 to 50 ewes to each mature ram, with fewer for ram hoggets and old rams.

Ewes which have not conceived on their second mating should be eliminated from the flock.

Ewes under 18 months old should not be bred from.

Ewes should be dagged before the rams go out to them.

On intensive and semi-intensive sheep farms raddling the rams and changing the colour every 17 days (the oestral cycle period) is a measure worth consideration, as it will enable the farmer to sort his ewes out into lots due to lamb at about the same time, the gestation period of the ewe in New Zealand being 145 to 150 days. It also enables rationing of sheep feed in the late winter and early spring accordingly, and thus goes far toward eliminating sleepy sickness (ante-partum paralysis) risk, and facilitates the quick picking out and removal from the flock of barren ewes.

In raddling rams the raddle paste should be smeared on the brisket (the bare patch between the forelegs), not the breast. To do this the ram must be turned up. If the raddle is put on

the front of the ram's chest, the ram may mark ewes which he has not served. A form of harness which greatly simplifies raddling of rams is now available.

If rams being put to the ewes or being put back with the ewes are held at the gate of the paddock, ewes in heat will approach. This will prevent false marking by over-keen rams jumping the first ewes they come near.

Ewes which, because of diseased ovaries, constantly take the ram will be quickly spotted on daily inspections.

Under the Stock Act Amendment, 1945, only approved raddles may be used. Suitable raddle powders are obtainable, and tallow, castor oil, neatsfoot oil, and crude lanoline (wool grease) have been found satisfactory materials with which to mix the raddle powder. Power kerosene may be used for thinning. An article "Loss caused by Wool-branding Fluids which will not Scour out," by J. E. Duncan, Wool Supervisor, in the October, 1947, issue of the "Journal" contains fuller information on raddles and their application.

Applications for Supplies of Hilgendorf Seed Wheat

ELSEWHERE in this issue of the "Journal" appears an article dealing with the results to date of trials carried out with a new variety of wheat raised by the Wheat Research Institute and named Hilgendorf. A limited quantity of Certified Mother seed of this variety is now available for distribution to farmers for multiplication of seed supplies and to gain wider information about the value of the variety under farming conditions.

Farmers who wish to sow out a paddock of Hilgendorf wheat should apply through their usual merchants to the Director of the Fields Division, Department of Agriculture, Box 3004, Wellington. Applications, stating the quantity of seed required and the acreage to be sown, must reach the Director not later than March 26, when allocations of the seed available will be made by the Department in consultation with an officer of the Wheat Research Institute.

Successful applicants will be expected to re-enter their crops into certification in the following season, when they will be eligible to produce Certified Standard seed. Each application for seed will receive full consideration, but some preference will be extended to applications from areas in north and mid-Canterbury, where the best results with this wheat have been obtained to date.

SPRAYING SMALL FRUITS

Right — A powered spray outfit with a 60-gallon tank. This machine is too large to pass along the rows when growth has started. The use of 100ft. hoses (in circle) and the breaking up of the garden into 200ft. blocks eliminate packing of the soil under wet conditions. Such a machine could be improved by the fitting of a much larger spray vat — say, 200 gallons — to reduce time wasted in refilling.



Above and right — A light tractor drawing a 25-gallon powered outfit suitable for small gardens. This machine can be driven through the rows at all stages of growth, but the small tank capacity causes much waste of time in refilling. It has the advantages of low weight and mobility, and the short hose required makes the work of the operator lighter.



Equipment For Spraying Small Fruits

By J. H. WATT,
Orchard Instructor, Dunedin.

SPRAYING is not carried out efficiently in any of the areas of New Zealand where raspberries are grown. That fact emerged during recent investigations into problems connected with the production of raspberries in the Dominion. A few small fruit growers have good spray outfits, but the rest either do not spray at all or use obsolete, inadequate equipment, such as knapsack or hand pumps. Only five satisfactory machines, or machines that could be made suitable by minor alterations, were found to be in use, and three other outfits were suitable only for small gardens of up to three acres.

YET the experiments carried out by the Plant Diseases Division, Department of Scientific and Industrial Research, at Motueka and Riwaka during 1942-45 amply demonstrated that spraying is necessary. The increased yields obtained—averaging about 10cwt. an acre—and the improvement in plant vigour, giving an increased expectation of economic life by efficient disease control, well repaid the cost of spraying.

Those experiments were made in gardens which were severely infected with cane wilt, cane spot, and bud moth. By carrying out an efficient spray programme from the time of planting it seems that the number of applications could be reduced to three a season—at bud movement, when the fruit is half grown, and immediately after the harvest.

The approximate quantities of spray required for small fruits are:—

	At dormant stage (gallons an acre)	At full foliage (gallons an acre)
Raspberry ..	250	450 to 700
Loganberry and boysenberry ..	250	600
Currant ..	350	450 to 600
Gooseberry ..	350	400
Strawberry ..	—	150 to 250

Those figures give some idea of the type of spray equipment necessary to obtain efficient disease and pest control. For example: Seven acres of raspberries (an average-sized garden) would require 1750 gallons at bud movement and about 4000 gallons or more at full foliage. Applying it with a knapsack or hand pump would be a full-time task.

Photographs on opposite page by Hope Cross and Richardson.



[Hope Cross and Richardson photo.]

Hand Pumps

Spray outfits vary with the size of the garden. In the home garden the knapsack or bucket pump is quite satisfactory to control diseases and pests on the dozen or so stools or bushes.

In a small fruits garden of about one to three acres the hand pump capable of maintaining a pressure of 100 to 150lb., attached to a 50-gallon barrel mounted on wheels or a sledge, would be quite satisfactory for bush fruits planted 6ft. apart. The barrow type, of 12-gallon capacity and priced at £25 to £30, could be used for a small area of bush fruits or for small or larger areas of strawberries, on which little spraying is necessary. However, the time lost in travelling and refilling prolongs the spraying time and may result in inefficient control, especially in the spring when broken weather is likely.

Powered Outfits

A powered machine suitable for such small areas was seen in the Wairarapa. It is a two-wheeled, hand-drawn machine of 25 gallons capacity, the pump being powered with a 1½-horsepower petrol engine capable of maintaining 250lb. pressure on one hose. The cost is about £150. This machine can be used in market gardens and glass-houses. It can be drawn between the rows at all stages of growth. Delivery should be through a hose 20 to 30ft. long to which is attached a 2 to 3ft.

rod with one or two angle nozzles or a small "gun." However, the relatively-small tank capacity (25 gallons) causes a considerable loss of time in refilling.

For larger gardens powered outfits similar to the portable types used in orchards would be more efficient. With a pressure on two hoses of 250 to 350lb., complete coverage from tip to ground would insure all parts of the plant against infection from spores, and adequate tank capacity of 100 to 200 gallons would reduce time lost in refilling. This type of portable outfit would be quite suitable for applications in gardens where small fruits are planted 6 to 7ft. apart when little foliage or growth is being made, but for later sprays it would not be possible to pass between the rows without causing damage to the plants.

Methods of Spraying

Two methods are suggested to overcome the difficulty of applying foliage sprays where the plants are only 6 or 7ft. apart:

1. The building of a narrow-based sprayer; the width would have to be not more than 3ft. 6in., but that would mean a reduction of tank capacity, causing waste of time in refilling.

2. The laying out of the garden with a pathway every 200ft. along which the sprayer would be drawn; then each row could be sprayed to halfway with a long lead of hose.

SPRAYING SMALL FRUIT GARDENS . . .

This is a more practical method to avoid damage and for use in established gardens.

Rods should be short—2 to 3ft.—with double-angle nozzles to give coverage above and below the leaves. The placing of tall, white-painted stakes halfway between the cross paths—that is 100ft. from each main path—would give a good indication of where spraying should start or finish.

If a long and a short hose are used, the longer should be more than 100ft. and the shorter about 50ft. The short-hose man should assist the long-hose man to halfway—50ft.—and then while he sprayed back to the machine the long-hose man would work to the white stake, spraying one side. Then each would return to the half-way mark, spraying the other side of the row. When that was completed the short-hose man would assist in taking the long hose back to the machine and down the next row as before. Alternatively, two long hoses may be used, each man spraying a row on opposite sides of the spray outfit, but that would be fairly heavy work.

The systems described could be adopted readily in most established raspberry gardens, especially with the 6ft. x 6ft. stool system, by removing one row of stools across the width of the garden, giving a 12ft. track for the spray outfit.

Another method is to plant small fruits in rows 9ft. apart with the plants 4ft. apart; that will give the same number of stools an acre as 6ft. x 6ft. planting, but requires more hand cultivation.

With raspberries the hedge system 9ft. apart or stools 9ft. x 4ft. would be an improvement in many ways. In a garden with rows 9ft. apart ordinary portable spraying outfits could go down the rows at all stages of growth, thereby easing the work, as the operator would not have to drag a long

hose—20 to 30ft. would be sufficient. Alternatively, a fog or boom sprayer could be used effectively. With a portable outfit fitted with one hose of 100ft. and another of 50ft., two men could spray more than two acres a day.

A suitable machine of this type would cost about £200 and for economy three or four growers could combine to buy an outfit to be used in co-operation. Taken over 10 years on a



seven-acre garden the cost would be less than £3 an acre annually.

Cost of Spraying

The cost of equipment and sprays for raspberries is estimated at about £13 an acre a year—£10 for spray material and cost of application and £3 for equipment. Those costs are based on one bud movement spray of 450 gallons of Bordeaux 5:4:50 with 2lb. of arsenate of lead to 100 gallons and two foliage sprays of 600 gallons of Bordeaux 3:4:50 with 2lb. of arsenate of lead to 100 gallons. An increase of 5cwt. in the yield of fruit through disease control (and up to twice that increase has been produced in the Plant Diseases Division's trials on raspberries) will give an increased return of almost £18 15s. at 8d. a pound net, or a net increase of £5 15s. an acre. In addition, control of diseases and pests may give an increased economic life to the garden.

Costs of spraying can be reduced by the use of larger tank capacity and efficient refilling equipment. The overhead tank with a large outlet pipe will considerably reduce time and, therefore, labour costs on a larger area.

Adjustable Boom System

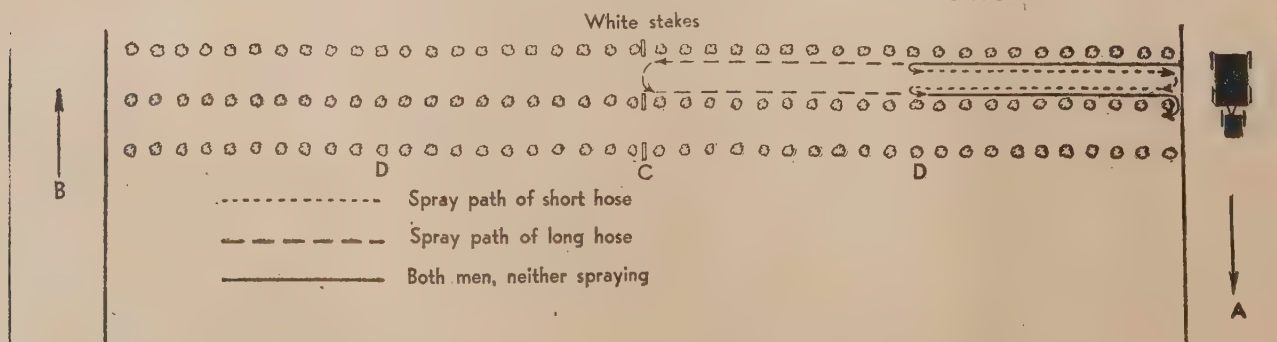
Another suggested method to reduce costs and time is to equip a large portable-type outfit with an overhead adjustable boom capable of spraying several rows on each side of the machine as it moves along the pathway. Such a machine would be satisfactory for new plantings where provision could be made for pathways, and altering established gardens by removing rows at specific distances would not be difficult. For instance, if the boom was long enough to spray four rows on each side of the machine track, every ninth row would need to be wide enough for the machine to pass along without damaging the plants—that is, 9ft. or more. To avoid difficulty in turning or transport the arms should be swivelled and locked at right angles to the machine for spraying and parallel to it for transport. An adjustable hoist would allow the height of the boom to be altered for the height of the crop to be sprayed.

Three-quarter-inch galvanised piping should be used for the main cross-arm, suitably braced for rigidity by wire rope or steel strips from the outer ends to the uprights on the sprayer. With a 9ft. pathway for the machine and rows 6ft. apart, 39ft. of $\frac{1}{2}$ in. piping would be required to spray four rows each side of the machine.

Six feet apart along the main arm of the boom, 4ft. lengths of $\frac{1}{2}$ in. galvanised piping should be fitted so that they are midway between the rows to be sprayed, and several angled nozzles should be spaced along these "rods" so that they give full coverage to the plants on either side. The number of nozzles would depend on the height and type of the bushes.

The spray should be fed from the pump to the arms of the boom through pressure hose which will allow the movement necessary in altering height and position of the boom. When turning on headlands only a moment's work would be needed to swing back the outer arm after the boom had been lifted to clear the bushes. For

LAYOUT FOR A SMALL FRUIT GARDEN WITH 6ft. ROWS



This layout is designed to facilitate spraying by two men with a portable outfit, one with 50ft. and the other with 100ft. of hose. A and B are 12ft. passages 200ft. apart for the spray outfit. C marks the limit of the long hose from A and B, and D the limits of the short hose.

efficient working a high-capacity pump would be necessary to give sufficient nozzle volume and pressure to the many nozzles on the boom, and a large tank capacity of up to 600 gallons would assist economical working.

Such equipment would reduce the cost of spraying by reducing time and labour, for it could be operated by one man and could spray much more rapidly than two men with hoses and rods. Any extra initial cost would be offset by reduced cost of operation and more adequate and timely application of specifics, particularly during the spring, when broken weather often causes expensive delays and wet ground makes hose spraying more arduous.

Tractor Equipment

Two interesting sprayers are in use on a property growing 100 acres of raspberries at Christchurch where the hedge system is adopted. Both are of the fixed-boom type with pumps driven by power take-off from the tractors on which they are fitted.

One is a wheeled tractor with special axles to narrow the wheelbase. A belly tank of 80 gallons capacity is fitted under the crankcase, and the pump is fitted on the axle housings under the seat. Two upright, fixed booms are fitted with five nozzles each, the top ones turned down and some of the lower ones turned up to give full coverage. With

this outfit it is estimated that one man can spray (including refilling and mixing) five to eight acres a day, but with larger tank space that could be increased. The other outfit is of a similar type on a 10-horsepower crawler tractor but has only a 30-

gallon tank and so is much less efficient.

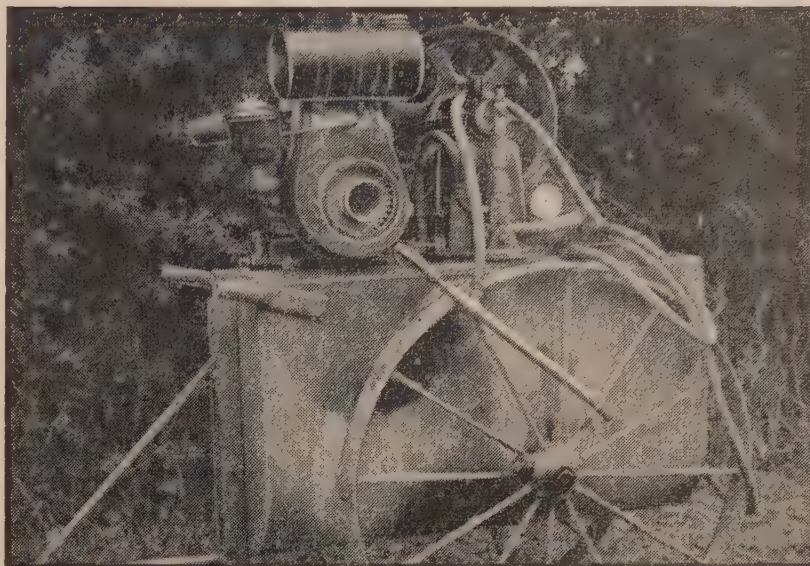
These types of machines cut labour costs and time taken in spraying, but it is doubtful whether they are as efficient in controlling diseases as the portable outfits with hoses. One of the chief aims in controlling diseases in raspberries, other brambles, and currants is to spray right to the ground among the canes, and it is doubtful whether boom-type sprayers are as effective in this respect as hoses and short rods with angle nozzles. Another advantage of the hose and rod is that the same equipment can be used for all small fruits, including strawberries, whereas fixed-boom types need adjusting to the heights of plants, which in most cases vary with age, to avoid waste.

Possibilities of Dusts

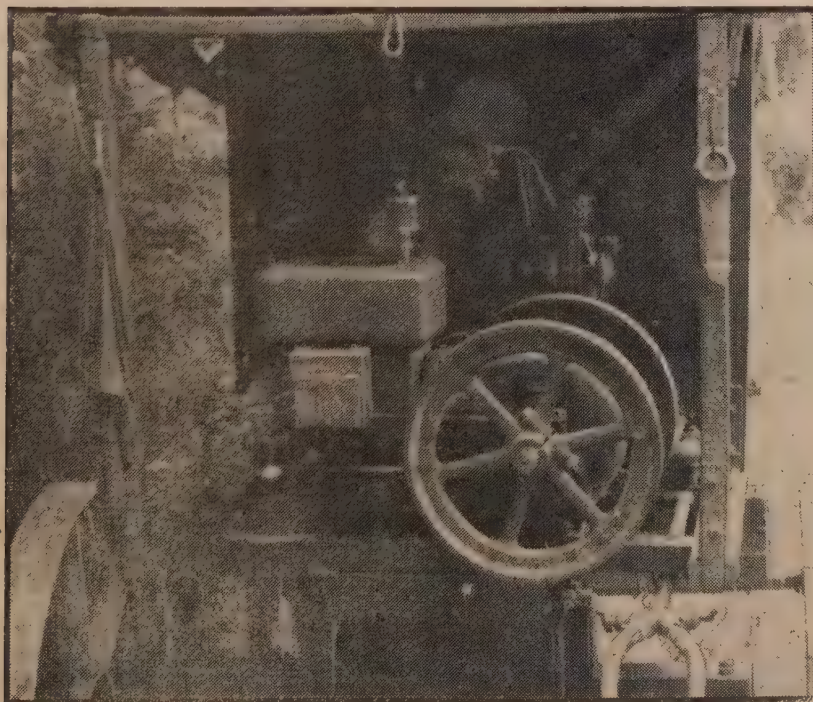
It seems likely that dusts could be used effectively for disease and pest control, especially during the foliage period. From the time when the fruit is half grown to harvesting, a dust which will control bud moth would be of very great value, as it is not desirable to spray with arsenate of lead during this period.

Several types of dusting machines are on the market, the most useful of which are the knapsack type with lever-action air pump and the rotary spinner. To either type the outlet can be fitted to give forward or backward delivery, and a large area can be covered with fungicide and insecticide in a short time. However, until a suitable dusting compound is found no definite recommendations can be made.

SPRAYING SMALL FRUIT GARDENS



[Hope Cross and Richardson photo.]
A 25-gallon powered machine suitable for small gardens. It may be tractor or hand drawn.



[Hope Cross and Richardson photo.]
A rear view of a 60-gallon outfit suitable only for headland travel, showing the transversely-fitted petrol engine and hose attachments.

Dr. C. S. M. Hopkirk to be Veterinary Officer in London

DR. C. S. M. HOPKIRK, who was in charge of the Department of Agriculture's Animal Research Station at Wallaceville until 1945, when he accepted an appointment with UNRRA, with which he served for two and a-half years, has been appointed to replace the late Colonel H. A. Reid as veterinary adviser to the New Zealand High Commissioner in London. Dr. Hopkirk left for England recently accompanied by his wife and two daughters, one of whom is superintendent of a kindergarten at Petone and the other a poultry farmer, holding a diploma from Massey Agricultural College, Palmerston North.

During a distinguished career of more than 30 years with the Department of Agriculture Dr. Hopkirk has made many valuable contributions to knowledge of stock diseases in New Zealand. He has been closely associated with research into mastitis, facial eczema, black disease of sheep, and sterility problems.

During the period he was with UNRRA Dr. Hopkirk was senior veterinary officer in Europe and China. His duties, which took him into all the

countries of eastern Europe, involved the procuring of veterinary supplies and the rehabilitation of production laboratories, research and diagnostic stations, and veterinary schools in many of the war-ravaged countries. One of Dr. Hopkirk's most important undertakings was to plan the establishment of a veterinary division in Ethiopia—an innovation in a country where the incidence of stock diseases is very high. Dr. Hopkirk was asked to implement his plan but declined the position offered him. In the course of his UNRRA work Dr. Hopkirk covered more than 100,000 miles by air alone. In all the countries he visited he was impressed with the desire of the people for improved veterinary services and with their willingness to accept advice.

Born at Hamua in 1894, Dr. Hopkirk was educated at Brooklyn Primary School, Wellington Boys' College, Victoria University College, and later at Melbourne University, joining the staff of the Department of Agriculture at Wallaceville in 1912. In the early days of the 1914-18 war much of his work was concerned with the treatment of



[S. P. Andrew Ltd. photo.
Dr. Hopkirk.]

sick and injured horses from the Remount Station at Trentham, and in 1915 Dr. Hopkirk, then a corporal in the New Zealand Veterinary Corps, went to Samoa with a draft of horses. In 1917 he left as a trooper with the Wellington East Coast Mounted Rifles and fought in the Egyptian campaign.

In 1919 Dr. Hopkirk returned to New Zealand and was at Wallaceville for a year before going to Melbourne University, where he studied in the faculty of Veterinary Science. In 1923 he graduated B.V.Sc. with first-class honours. A subsequent offer of a teaching and research scholarship was declined by Dr. Hopkirk, who returned to the Dominion to take up the appointment of officer-in-charge of the Wallaceville Veterinary Laboratory, as it was then known. Dr. Hopkirk continued to be intimately associated with research at Wallaceville, which in 1939 was incorporated in the newly-formed Animal Research Division of the Department of Agriculture and was named the Wallaceville Animal Research Station.

Dr. Hopkirk was awarded the degree of Doctor of Veterinary Science by the University of Melbourne in 1934 for a thesis on mastitis in dairy cows. He was president of the veterinary section of the Australian and New Zealand Association for Advancement of Science at its Melbourne meeting in 1935 and was later awarded an association fellowship. In 1938 Dr. Hopkirk made a world tour on behalf of the Department of Agriculture and represented New Zealand at the first Imperial Veterinary Conference in London and at the International Veterinary Congress in Switzerland in the same year. For 21 years he was an office bearer of the New Zealand Veterinary Association and was president in 1941-42 and 1943-44. He is an honorary life member of the association.

FLOCK HOUSE TRAINEES VISIT FAT LAMB FARM

TO further their knowledge of fat lamb production the trainees of Flock House Farm of Instruction recently visited Mr. J. Cornfoot's property, Surrey Farm, Bulls. This farm is well known not only for its high-quality fat lambs but also for its pastures and high standard of fences, gates, and other facilities. Mr. Cornfoot explained the reasons for his purchase of a certain type of Romney ewe and illustrated with the lambs his aim in fat lamb production. Mr. J. Caithness, a well-known Marton fat stock buyer, gave a comprehensive lecture on the requirements of the fat lamb trade. Mr. Cornfoot outlined his management of stock and pastures and answered numerous questions from the trainees. Morning tea gave Mr. Cornfoot a little relief from questions, though several animated discussions on fat lamb production took place among the trainees and Mr. Cornfoot was appealed to for his judgment on several arguments.

A concrete post-making outfit with which Mr. Cornfoot makes all his own posts and strainers was inspected and a very full morning concluded with a general inspection of the farm. Mr. Cornfoot's parting words might well be the keynote of Flock House training: "Whatever you do, do well, and always watch what is going on around you. Keen observation and the ability to grasp the salient facts are among the chief attributes of successful farm husbandry."

—J. H. HITCHCOCK,

Farm Training Supervisor, Flock House Farm of Instruction, Bulls



Planning Necessary to Make Use of Whey as Pig Food

By A. LONGWILL, *Assistant Superintendent of the Pig Industry, Wellington.*

RESULTS of a survey carried out to ascertain the extent of wastage of whey from cheese and casein factories throughout New Zealand were reviewed in an article in last month's "Journal." The survey showed a considerable variation in the extent to which whey was utilised. As pig raising is one of the obvious ways of using the surplus whey, it would appear that its value for the purpose is better appreciated in some districts than in others. With a view to making available the experience of those who are successfully using whey, this article deals with the problems of whey feeding on both factory and farm scale.

THE main factors, which are common to both, are:

Gallon for gallon, whey has two-thirds of the feed value of skim-milk.

It is deficient in protein as a feed for pigs, particularly young pigs and pregnant and nursing sows; meat meal is the best supplement to make up the deficiency.

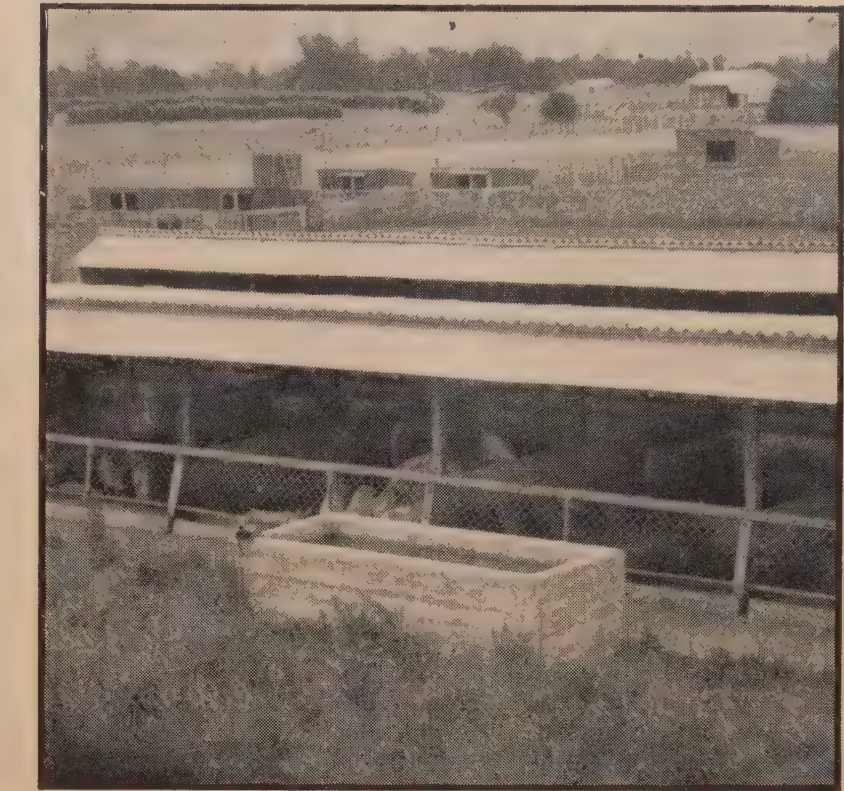
Its bulkiness as a feed necessitates judicious meal supplementing if the young pigs are to grow satisfactorily and avoid digestive upsets.

Fluctuations of supply during the season necessitate a carefully-planned breeding programme, to adjust the feed requirements as closely as possible to the estimated supply, and a comprehensive plan for the provision of the necessary supplementing feed.

Supplementary Feeding

The factor of fluctuating supply applies to all dairy by-products, and their economic use depends largely on the success achieved in solving these problems. The higher meal supplementing required necessarily means a lower farm return per gallon than can be obtained from the other by-products, but a return of 1d. a gallon after paying for all meals should be a reasonable possibility at present prices.

One difficulty in securing full utilisation of whey as pig food is immediately apparent if the desirable level of meat meal supplementing is considered in relation to the supplies available.



Fattening houses with run-out paddocks and areas of crop on a commercial piggery.

Ideally, pregnant and nursing sows and weaners require 1lb. of meat meal to every 3 to 5 gallons of whey; 1lb. to 15 gallons will suffice for fattening baconers. If 1lb. to 8 gallons is taken as the average rate of supplementing, 9000 tons of meat meal would be required for this purpose annually, apart from a similar quantity which would be required for wintering adequately the pigs necessary to ensure utilisation of the whole of the dairy by-products available.

The total quantity of meat meal produced in this country, about 18,000 tons a year, would thus be entirely taken up for those two purposes alone. Requirements of poultry keepers and other stock raisers, including pig breeders who feed skim-milk and buttermilk, who need some meat meal for sows and young pigs, increase the total stock feed requirements to a figure well in excess of the amount available. Many farmers who could use more whey are reluctant to do so because of uncertainty of meat meal supplies. The small quantities of fish meal and other protein-rich concentrates available in this country at present are totally inadequate to meet the position.

Where it is economically practicable consideration should be given to growing crops which can help the protein supply. Those most likely to be of value to the whey feeder are peas for harvesting for winter feed (preferably grown in the arable districts, as harvesting conditions in dairying districts are generally too risky) and rape, thousand-headed kale, lucerne, or young clover pasture for autumn grazing.

Factory Piggery

Considering the bulky nature of whey and the fact that it is bulked at the dairy factory, it is surprising that very few attempts have been made to use the whey at a central piggery rather than have individual suppliers take a portion of the whey to their own piggeries—incidentally creating a problem for the cheesemaker if they use their own milk cans for this purpose. In a few cases pig producers contract with the company for the whole output or a large portion and specialise in pig production. Twenty-five years ago butter factories found



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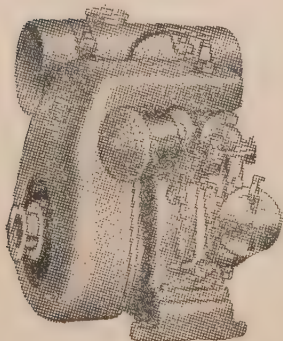
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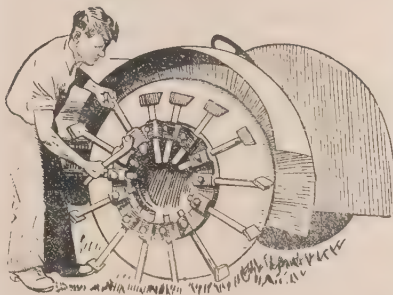


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difficulty in disposing of their butter-milk until it became recognised as a suitable basic feed supply for commercial pig raising on an extensive scale. Perhaps the present attitude to whey as a basis for commercial pig production is similar, and realisation of the value of whey may bring an expansion in its use at central piggeries.

One thing learnt during years of experience with large-scale piggeries—that the layout must be planned to provide proper drainage and sanitation and give control over the pigs if it is to remain an efficient producing unit—should be applied wherever extensive commercial piggeries are envisaged.

Presuming that suitable land is available—10 acres to each 100 tons of cheese output should be adequate—and the necessary layout for breeding and fattening all pigs required has been erected, the steps which have to be taken are:

Determine the number of sows to be carried and farrowing dates.

Decide on the labour required.

Ensure supplies of meat meal or other protein supplements and farm crops to provide adequate feed for pigs on hand throughout the year.

Some producers may prefer to buy large store pigs for whey feeding but, if the facilities and labour position permit, it is undoubtedly better to breed all the pigs required. That reduces the risk of introducing disease and eliminates the necessity of entering the market for store pigs when it is at its peak.

For every ton of cheese produced the total whey available will be about 1680 gallons. With supplementary feed to the extent of 1 ton of meal and 8 to 10 tons of roots and grass, 8500 gallons of whey will suffice to carry one sow taking one litter, born in May or June, to bacon weights in December and the second litter, born in November or December, to pork weights in April. With this level of supplementing, one sow for each 5 tons of cheese output should be the aim.

One man can handle 20 to 30 sows as a unit—that is, equivalent to 100 to 150 tons of factory output—with one extra labour unit for each 30 sows (150 tons of cheese) above that level. A family of father and three sons handling the output from a 500-ton factory would probably provide a most economic unit.

The food-provision plan and requirements of stock on such a piggery are depicted in the diagram on this page. The monthly total of whey available reaches a peak of about 130,000 gallons during November and December and falls to negligible proportions in June. To meet this severe fluctuation two main lines of action are taken:

... USE OF WHEY AS PIG FOOD

1. Sows are farrowed mainly in May and June and again in November-December. That means that the first litters are finishing as baconers when the sows farrow again, and can be released as fats, as the sows and litters are able to consume the whey. The extra meal consumed during the months when farrowing is concentrated goes to the sows and suckers.
2. Adequate provision is made for home-grown crops, including a green crop to be grazed in February, March, and April so that second litters can be taken to good porker weights, and root crops to provide the bulk food for the sows and any stores which have to be wintered.

This planning is essential to efficient use of the whey available. Twenty-five to 35 acres of crops on a piggery of this size would provide the essential cheap basic food to bridge the gap between seasons and with efficient cultivation would provide a much cheaper food (3d. a food unit) than could be bought (1½d. a food unit). Though individual farmers may well find breaking up small areas of grass for pig crops uneconomic, undoubtedly it can be done economically on a larger scale. The fertility left by the

pigs can be taken advantage of in this way and very little additional fertiliser is required for the crops.

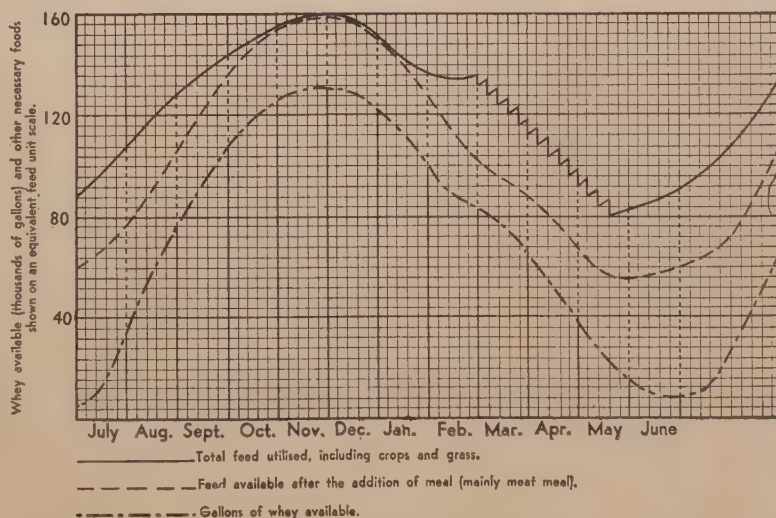
The lower line of the graph represents the quantity of whey available monthly during the season and the middle line additional feed, represented by meal fed, varying from 5 to 13 tons a month. The top line shows the total feed requirement, the difference between this and the second line being supplied by home-grown crops and grass. The serrated form of this line over the months of March, April, and May is caused by the fact that regular consignments of porkers are being put off without any young pigs coming on to take the extra feed as occurs in the disposal of the first litters.

The total food provision is 850,000 gallons of whey, 110 tons of meal (mainly meat meal), and 850 tons of farm crops and grazing. The output, under good management along the lines described, should be about 70 tons of pig meat, worth at present prices £6000 gross.

Farm Piggery

Suppliers near a factory usually can arrange with others not so conveniently situated to take their share of

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the whey available. Whether extra whey is taken will, of course, influence the production plan. If no extra whey is obtained and the aim is to breed all requirements, taking pigs to bacon weight in the flush and making porkers of the second litter, as described, one sow to each 24 cows in the herd should suffice to provide the pigs required, though it may be safer to carry one sow to 20 cows with the aim of selling surplus weaners if farrowing results are good. If all weaner production is the aim, one sow to 12 cows can be run.

The supplements required for each sow, if farrowings are arranged to take place in May-June and November-December, are 1 ton of meat meal, $\frac{1}{4}$ acre of a good root crop such as artichokes or sugar beet, and access to good grazing, preferably with a special green crop to be grazed from February to April where pigs are being fattened as porkers on the declining whey supply.

On the half baconer-half porker system of production an output of 12 to 14 pigs a sow, totalling 1500 to 1700lb. of pig meat, is a reasonable standard of performance. At present prices that represents a gross return of about £60 a sow or, after allowing for purchases of meals, a farm return of more than £40 a sow should be obtained to cover labour and other farm production costs.

To achieve these results the essentials are:

An appreciation of the value and limitations of whey as a pig food.

A live interest in the proper utilisation of the by-products of the farm, reflected in attention to detail in management and in good pigs kept

under conditions in which they will thrive.

Avoidance of digestive troubles by cleanliness in feeding methods. Bring young pigs on to full whey feeding gradually; $\frac{1}{2}$ lb. of meal a day and a little tallow for a week or two after weaning will pay, the meal being reduced to $\frac{1}{4}$ lb. a day when the pigs are used to the whey diet. Automatic ballcock feeding may be quite satisfactory with pigs having a free run on grass, but should be used only for pigs which have been accustomed to the diet gradually. Ground limestone at the rate of $\frac{1}{2}$ lb. to 100 gallons of whey should be stirred in the whey tank; it not only supplies a valuable mineral in the feed for rapidly-growing pigs, but counteracts the development of a dangerously-high acidity.

Warning about "White Whey"

A warning should be given about the "white whey" which is drawn off after the salting of the curd and normally is run down the drain at the factory. If by accident this salt whey were run into the whey tank after most of the day's whey had been taken by the suppliers, the next man to draw whey might get a dangerous concentration of salt in his share. Fortunately that is a remote possibility today, but an accident may happen.

If pigs refuse a feed for no apparent reason, the whey should be tested and, if salty, tipped down the drain, the factory manager consulted and, if a mistake has been made, all the salty whey disposed of and fresh whey obtained.



Baconers at the trough fattening on the whey brought back from the factory and supplemented with $\frac{1}{2}$ lb. of meat meal per head daily.

... USE OF WHEY AS PIG FOOD

Mother Liquor and Whey Paste

Two storable by-products of the extraction of sugar of milk from whey, mother liquor and whey paste, are available in considerable quantity from the extraction plants now operating in Southland and Taranaki. So far as they go, these by-products can be used to help level up the feed supply, and being storable they can be used in the winter. Broken down with water in the proportions of 1:5 for mother liquor and 1:9 for whey paste, and supplemented with meat meal, they will provide a suitable basic winter feed, though the cost may be greater than that of farm-produced crops. However, the possibilities of these feeds need fuller investigation.

SHOW DATES

THE following are dates and venues set down for A. and P. shows in March and April. Owing to health precautions these are subject to postponement or cancellation.

March 1—Matamata A. and P. at Matamata.

March 6—Albany A. and P. at Albany.

March 6—Mangonui County A. and P. at Kaitia.

March 6—Maniototo A. and P. at Ranfurly.

March 6—Waioitira A. and P. at Waioitira.

March 10—Morrinsville A. and P. at Morrinsville.

March 12 and 13—Whangarei A. and P. at Whangarei.

March 13—Cheviot A. and P. at Cheviot.

March 13—Kumeu District A. and H. at Kumeu.

March 13—Mt. Benger A. and P. at Roxburgh.

March 13—Temuka and Geraldine A. and P. at Winchester.

March 13—Hawke's Bay A. and P. at Hastings.

March 17—Lake County A. and P. at Arrowtown.

March 20—Mayfield A. and P. at Mayfield.

March 20—Wellsford A. and P. at Wellsford.

March 20—Upper Clutha A. and P. at Wanaka.

March 25—Hawarden A. and P. at Hawarden.

March 27—Methven A. and P. at Methven.

March 29—Strath Taieri A. and P. at Middlesmarch.

March 29—Mackenzie County A. and P. at Fairlie.

April 2 and 3—Taranaki Metropolitan A. and P. at New Plymouth.

April 3—Waimate A. and P. at Waimate.

April 10—Poverty Bay A. and P. at Gisborne.

April 24—Flaxbourne A. and P. at Ward.

"LYRIC SPIRAL, LIGHTED WHORL"

MOST of us at one time or another have tried our prentice hand at collecting, even if the lure lasted only for a brief period. Stamps or souvenirs, butterflies or Bristol glass—whatever the nature of the collection, its value lies not merely in its intrinsic worth (which may be slight), but in the pleasure it gives the beholder and the increasing knowledge such an interest develops. Those whose hobby hinges on natural history regard Stewart Island as a collector's paradise and are inclined to envy the folk fortunate enough to reside in a locality so rich in native flora and fauna.

Two of the Island's most enthusiastic naturalists are the Cedric Smiths, of Halfmoon Bay. Their curio cabinet contains such interesting items as the transparent envelope egg-case of a skate and the skull of a kiwi, the sole bird to have nostrils at the extreme end of its beak, which is sometimes as much as seven inches in length; Maori axe heads in various stages of completion (the majority are of green, mottled stone called uri, and traces of sedimentary rock still adhere to a couple of them); shell segments of moa's egg; a bulbous branch of the bull-kelp the natives used for a barometer, as it deflates in damp weather and swells up in sunshine; the soft, furry skin of a little grey bush rat; heavy black iron sand; a seal's ivory-smooth earbone; the tongue-shaped tail of a deer, deemed a most popular delicacy by the Chinese; sparkling asbestos, both in fibre and rock form; lumps of ambergis that look like tailor's wax; and the wing bones of an albatross, a single span alone measuring over four feet. The bear's claws had been contributed by an American guest and the two fragments of granite were brought back some years before by Dr. Simmers from his particular portion of Antarctica, each member of the expedition having a tract of land named after him.

Mr. Smith is a past master in the art of pressing ferns, and his extensive collection of Stewart Island orchids, each specimen mounted separately between slender oblong panels of glass, is rendered even more attractive by the accompanying folio of drawings depicting the various species in detail, these having been delicately executed in water colour by his wife. Mrs. Smith's main spare-time occupation for many years, however, has been the gathering of shells. These she has stored and classified in the most scientific manner, and conchologist and casual visitor alike can appreciate and enjoy the fascinating beauty of these treasures of the sea. Pride of place is given to

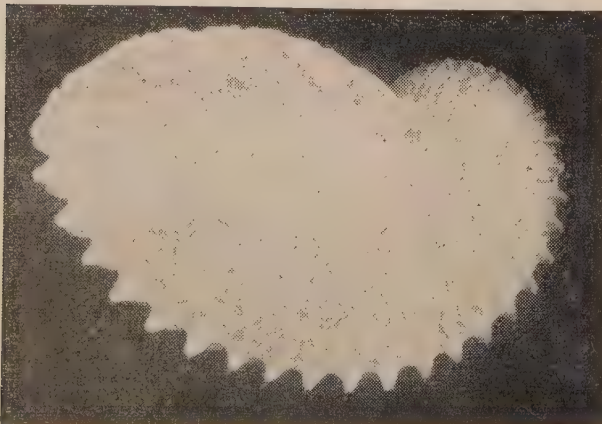
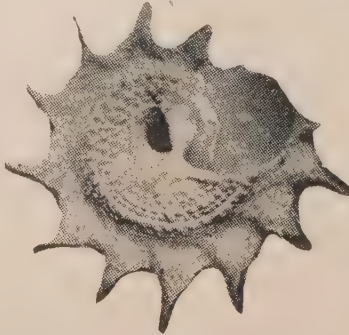
that most precious of shells, the paper nautilus. Reposing in solitary splendour within a special glass box, its "lighted whorl" is white and lustrous as summer moonlight on the waters of the bay where it was found. Strange that such an exquisite creation shelters the close relative of so repulsive a creature as the octopus. Moreover, this fragile shell, which floats upon the sea like a ship and has tiny oar-like protuberances that heighten its resemblance to Jason's vessel in the ancient Greek legend, is the exclusive property of the female *Argonauta*, her spouse being negligible in stature and minus any sort of shell at all. It is the "Chambered Nautilus" of which Oliver Wendell Holmes wrote:—

*This is the ship of pearl, which, poets feign,
Sails the unshadowed main—
The venturous bark that flings
On the sweet summer wind its purpled wings
In gulfs enchanted, where the siren sings,
And coral reefs lie bare,
Where the cold sea-maids rise to sun their streaming
hair.*

The oyster is as prolific in Fouveaux Strait as the nautilus is rare. Chief of its marine enemies are several species of small, sharp-toothed shellfish which bore through the oyster's strong shell and make a meal of their victim. A neatly-drilled hole in the middle of one of Mrs. Smith's exhibits demonstrates the oyster borer's depredations, and she also has the shell of a baby oyster which had attached itself to a fan shell. The circular saw shell with its steely purplish serrations frequents the oyster beds, as does the trumpet shell, whose shiny interior, white as spray and edged with sea-green ripples, houses an animal with the same powers of penetration as the oyster borer, being provided with a tongue that revolves with a rasplike action till it pierces the protective covering of its prey, the pipi.

Pearls are a valuable by-product of the oyster, and in Mrs. Smith's collection are several which have been procured from pauas. These are obtained very seldom; in fact, one of New Zealand's foremost authorities on mollusca says that he has found only six or seven puaa pearls during all the years he has been collecting sea shells. Their brilliant greeny-grey sheen is the same as that of the big oval sea ear whose opalescent tints have caused it to be designated *Haliotis iris* in honour of the rainbow goddess. The medium-sized silvery puaa has more the shading of a milk opal and is deeply grooved, while the rarely-viewed virgin puaa, though rather small in comparison with the others, has the brightest iridescence of all. Less spectacular connections of the puaa clan are the limpets. Notwithstanding their somewhat sober appearance, they have a charm all their own, and the tenacity with which they cling to the rocks and resist removal is remarkable. There are black-edged limpets and limpets blotched with brown and grey; grooved limpets and concentric-ringed limpets; white limpets slit lengthwise up the lower margin; deep-water limpets that have a keyhole-shaped aperture in the apex; and star limpets with a sunflower of silvery grey, reddish bronze, or gold as a centrepiece. The big black sea slug whose body is twice the size of the shell which serves as a shield for its vital organs also belongs to the slit-limpet family.

Stewart Island is noted for its scallop shells, especially the fans and file shells which are bigger and more brilliantly coloured than those found elsewhere. Single fans are sometimes



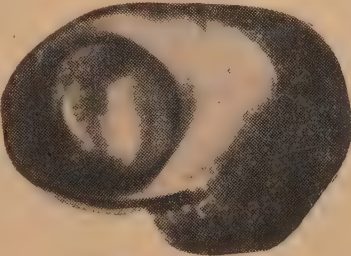
“LYRIC SPIRAL, LIGHTED WHORL”



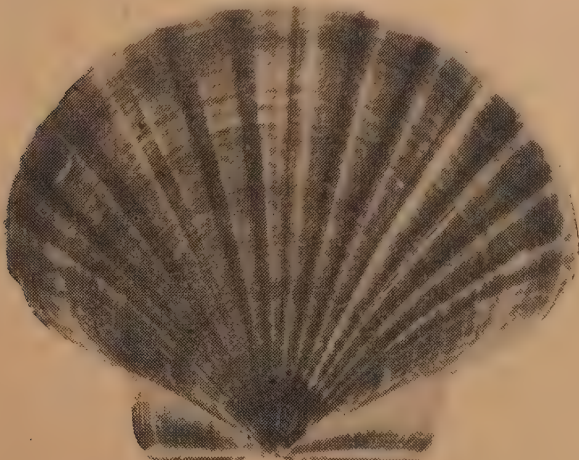
Halfmoon Bay, Stewart Island, where the nautilus was found.

[National Publicity Studios photo.]

washed up on Ringaringa Beach or Rabbit Island, but the double ones are usually dredged in 30 to 50 fathoms from the corallaceous deposit that forms the sea floor. Fishermen who often bring up large lumps of sea bottom on their hooks co-operate with the conchologists in securing choice deep-water specimens. Lemon and lilac fans, pinky-red, puce, and purple fans—Mrs. Smith has them all, but those she prizes most are a glorious orange. Equally lovely are the lamp shells, bivalved replicas of Roman lamps, complete even to a tiny opening at one end as if for a wick. The largest of these lights from the Sea King's palace shade from dull rose to dusk grey; others have radial corrugations of a deep coral colour, while the surface of the smallest is smooth and a rich, glowing red.

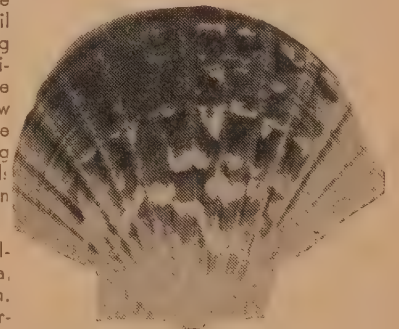


The chestnut-spotted trough shells are also denizens of the ocean depths, but the pearly myadoras, the pakira of the Maoris, lie like pale rose petals on the shores of Horseshoe Bay, and the rose and mauve-rayed sunset shells abound here, frail mementos of the sunset fires mirrored in these quiet waters, the Island's native name meaning "isle of heavenly glow." The



lightning shells with their zigzag markings are plentiful, too, and the handsome helmet shells, one variety of which is called after Mrs. John Harrison, the senior collector at Stewart Island. Three or four other shells also bear her name and she has discovered at least 20 species new to science.

That rarity, the carrier shell, which camouflages itself against enemy attack by cleverly cementing small stones and shells on top of its conical back, was sent from Omaha by Mr. A. W. B. Powell, Assistant Director of the Auckland Museum and author of two standard works on New Zealand shellfish. This little box of rice shells represents a considerable amount of effort, for you can spend a whole afternoon raking the sand at Rabbit Island and perhaps only six shells will reward your search. Here are trays of toenail shells, lacquered vermilion, lotus pink, or Chinese white; green-spined sea urchins and the flat, circular cake urchin that fishermen call snapper biscuit; snowy-spiralled curly shells and rose-stippled whorls which the Island residents use to pave their paths, the effect being singularly pleasing; violet snail shells whose occupants deposit their eggs on air-bubble rafts and tow them over the waves; tiny brown snail shells darkly gleaming like horn; others semi-transparent and the pale green of young willow leaves in spring, the chalky specimens being fossilised snail shell from a sandbank by an old Maori oven.



The study of the smallest species of mollusca, which range from $\frac{1}{16}$ in. in diameter to the merest speck and whose perfection of form can be perceived only under a microscope, is a whole story in itself. Contemplation of this wondrous harvest of the seashore brings a new understanding of the lovely imagery of Dorothy Wellesley's lines accompanying her gift of a shell to the great Irish poet and dramatist W. B. Yeats:—

*Lyric spiral, lighted whorl,
Flight of stars at mouth of pearl,
Infinity within an ell,
Rainbow steps and starry sense,
All the iris influence
In the spectrum of a shell.*

Many

Picnic Fare

SUMMER is the busy time on the farm, but sometimes a lull in the work and a fine day coincide and then the whole family votes for a picnic. In the bush, by the sea or the river, even just under the trees in a nearby paddock, a picnic is an enjoyable change from the daily routine of house meals.



By EVA TOPPING,
Rural Sociologist, Auckland.

COMMUNITY picnics, like school sports, usually mean organising extra baking beforehand. From the housewife's point of view, the pleasantest part of an impromptu picnic is the saving of a lot of planned work. Outdoor appetites are keen and any food tastes good in the open air.

The Picnic Shelf

For the "picnic-in-a-hurry"—the one the children clamour for because it is a lovely day—the picnic shelf is a good idea. Part of a cupboard can be kept stocked with some of the makings of a simple meal and all the gear needed. Here will be the baskets, billies, tins of tea and sugar, bottles for milk and other drinks, cups, mugs, spoons, knives, salt and pepper

shakers, and an abundance of wrapping paper and cloths. Empty aspirin bottles with their screw caps make excellent containers for salt and pepper; the tops should not be pierced or the contents will spill during transit. Old or cheap-quality spoons, knives, and forks can be kept for picnics, for these small things are often overlooked in the repacking of the baskets and to lose part of a good set of cutlery is provoking. A selection of tins with lids can include square ones for sandwiches, smaller sizes for crisp biscuits and cakes, larger ones for pies and savouries. Cardboard boxes are handy for fruit, tomatoes, lettuce, and other similar foods. A set of small jars with lids for individual servings of salads or desserts is a useful addition.

For the provisions, tins of fish, meat, meat pastes, packets of cheese, jars of vegetable extract, salad dressing,

pickles, and sauces are stores which will keep for some time and are ready at a moment's notice. Bottles of concentrated fruit syrups should also be included.

Sandwich Fillings

Jars of other sandwich fillings which will remain fresh for a short time can be prepared and stored in a cool place. Here are some recipes for tasty fillings of this kind:—

Carrot, Peanut, and Raisin

1 cup of seedless raisins	1 cup of salted peanuts
1 cup of grated raw carrot	

Put the ingredients through the mincer, using the coarse cutter. Mix in $\frac{1}{2}$ teaspoon of salt and from 2 teaspoons to 2 tablespoons of lemon juice.

Photograph in heading by Sparrow Industrial Pictures Ltd.

Press the mixture into jars and cover and store them until required.

Carrot and Peanut

- | | |
|--|---------------------------------------|
| 1 cup of finely-grated raw carrot | 3 tablespoons of thick salad dressing |
| $\frac{1}{2}$ cup of chopped roasted peanuts | Good pinch of salt |

Mix all the ingredients together thoroughly.

Minced Ham

- | | |
|----------------------------------|---|
| $\frac{1}{2}$ cup of vinegar | 1 egg, well beaten |
| 1 teaspoon of mixed mustard | $\frac{1}{2}$ lb. of lean ham or boiled bacon, minced |
| $\frac{1}{2}$ cup of brown sugar | |

Combine all the ingredients except the meat and cook them for 5 minutes—until they are thickened but not curdled. Mince the ham or bacon finely and add the sauce when it has cooled. Put the filling into small jars and run melted butter or dripping over the tops to seal them.

Liver

- | | |
|---|-------------------------------|
| 10oz. of liver | $\frac{1}{2}$ cup of top milk |
| 2 hard-boiled eggs | Salt and pepper |
| 1 tablespoon of good dripping, preferably bacon fat | Pinch of powdered sage |
| | 1 small onion |

Steam the liver for 25 minutes, then cool and mince it. Chop the egg whites very finely and mash the yolks. Cut the onion fine, brown it slightly in the bacon fat, and add it to the liver mixture, blending them well. Mix in the top milk and seasonings. Press the filling into jars and store them in a cool place. This mixture will not keep fresh for any length of time.

Mock Chicken

- | | |
|--|--|
| 1 cup of minced cooked pork, veal, or rabbit | 3 tablespoons of mayonnaise dressing |
| $\frac{1}{2}$ cup of grated raw carrot | 2 tablespoons of chopped mixed pickles |
| $\frac{1}{2}$ cup of chopped celery | Salt and pepper |

Mince the meat, grated carrot, chopped celery, and pickles. Mix in the

dressing and season well. Store in a cool place.

Neither of the last two fillings will keep well in hot weather unless stored in a refrigerator.

Sandwiches

Sandwiches for picnics should not be cut too daintily; the bread can be almost $\frac{1}{4}$ in. thick and the slices cut only in halves. Wrap each kind of sandwich in a separate piece of paper, then pack all the little parcels together in a tin. A cloth wrung out of cold water and wrapped round the packages of sandwiches will help to keep them moist. Mild dripping or bacon fat make good substitutes for butter in savoury sandwiches.

Take lettuce washed, cut in quarters, shaken free of excess water, and wrapped in a cloth and then in waxed paper. Tomatoes should be washed and cut through in segments almost to the base. Put each cut tomato on a square of waxed paper, gather up the edges and make a twist at the top; when they are undone each tomato is provided with its own little waxed paper plate. Radishes, spring onions, celery, and cucumber are other good crisp things to eat with sandwiches. Tender young carrots scrubbed very clean and cut into match-sized strips down the length are also good companions for a sandwich.

The Sweet Part of the Meal

Biscuits or small cakes and buns which have good keeping qualities can be stored in tins or jars on the picnic shelf and will quickly provide the sweet course for a picnic. Here are some recipes for biscuits which keep well:—

Grasmere Gingerbread Biscuits

- | | |
|--|----------------------------------|
| 1lb. of flour | $\frac{1}{2}$ lb. of brown sugar |
| $\frac{1}{2}$ lb. of lard or $\frac{1}{2}$ lb. each of lard and butter | 2 teaspoons of ground ginger |
| $\frac{1}{2}$ teaspoon of cream of tartar | 1 teaspoon of baking soda |

Mix all the ingredients together, rubbing in the fat until the mixture is crumbly. Spread it into a flat tin, pressing it down well with the back of a spoon. Bake it in a moderate oven for 30 minutes. Cut the mixture into fingers and cool them in the tin.

Malt Biscuits

- | | |
|-----------------------------|----------------------------|
| $\frac{1}{2}$ lb. of butter | 1 teaspoon of baking soda |
| 1 small cup of sugar | 1 teaspoon of golden syrup |
| 1 egg | |
| 1 tablespoon of malt | |
| 2 large cups of flour | |

Cream the butter and sugar and add the beaten egg, malt, and syrup. Sift in the flour and baking soda. Roll the mixture thin, cut it into biscuits, and cook them for 10 minutes in moderately-hot oven. Watch them carefully, as these biscuits burn easily.

Wholemeal Ginger Nuts

- | | |
|--------------------------------------|---------------------------------------|
| 3oz. of butter | 3oz. of brown sugar |
| $\frac{1}{2}$ lb. of wholemeal flour | 1 teaspoon of ground ginger |
| 2 tablespoons of golden syrup | $\frac{1}{2}$ teaspoon of baking soda |

Cream the butter and sugar and add the warmed golden syrup. Sift the flour, ginger, and baking soda together and add them to the first ingredients. Form the mixture into balls the size of walnuts, set them on a cold, greased tray, and bake them in a moderately-slow oven.

Chocolate Fingers

- | | |
|----------------------------|----------------------------------|
| 2oz. of lard or butter | 4oz. of flour |
| $\frac{1}{2}$ oz. of sugar | 1 flat teaspoon of baking powder |
| 1 teaspoon of golden syrup | 3 level dessertspoons of cocoa |
| 1 egg | |



Take plenty of lettuce, tomatoes, radishes, onions, or other crisp salad vegetables to eat with sandwiches. [Sparrow Industrial Pictures Ltd. photo.]

FOOD FOR PICNICS . . .

Cream the fat and sugar, and add the syrup and lightly-beaten egg, mixing well. Sift the dry ingredients and beat them in gradually. Roll the mixture thin on a floured board and cut it into fingers. Bake them on a greased tray for 20 minutes at 350 degrees, cool them and sandwich them together with jam or chocolate filling.

Chocolate Filling

1 tablespoon of butter	1 tablespoon of cocoa
4 tablespoons of icing sugar	Top milk
	Flavouring

Beat the butter and sugar until they are soft, then add cocoa and flavouring, using just sufficient top milk to make the filling spread.

Thirst Quenchers

Fill a box with fresh fruit—bananas, plums, oranges, nectarines, any kind of fruit that is available, for it is most refreshing and thirst quenching. If there is some stewed fruit in the larder, fill a screw-topped jar and pack saucers or small jars and spoons in the basket. If there is fresh water at the chosen place, take concentrated fruit syrups, a tin of tea, bottles of milk, and a small billy or old tin kettle for the fire.

Whatever else is forgotten, be sure that every spark of fire is extinguished before the party leaves for home. It is always wise to put out the fire at once; then if it should burn up afresh it is noticed and put out. Many scrub fires have been started by picnickers who thought they had damped out their fire effectively.

Planned Picnics

When a picnic is planned a day or two ahead many delectable foodstuffs can be prepared. All kinds of moulded meat dishes, jellied salads, sausage rolls, Cornish pasties, meat pies, and savoury titbits of fish, cheese, or eggs make appetising picnic fare. They are more substantial and are a change from the sandwich and cake type of provender. Here are some suitable recipes:—

Scotch Eggs

4 or 5 hard-boiled eggs	1 egg
$\frac{1}{2}$ lb. of pork sausage meat	Breadcrumbs or oatmeal
Salt and pepper	Fat for frying

Shell the eggs, and cover each with sausage meat, roll them in flour, brush them with beaten egg, and dip them in crumbs or oatmeal. Fry them in deep fat until they are golden brown. Cool them and cut them in halves for serving.

Fish Balls

1 cup of cooked fish, flaked and free from bone and skin	1 egg, beaten slightly
Parsley	Salt and pepper
	2 cups of mashed potato

Mix all the ingredients thoroughly, form the mixture into balls, roll them in flour or fine dry breadcrumbs, and fry them in deep, hot fat for about 5 minutes until they are nicely browned.

Ham Cheesies

$\frac{1}{2}$ lb. of grated cheese	$\frac{1}{2}$ lb. of ham, minced very fine
$\frac{1}{2}$ cup of flour	

Cream the cheese and mix in the ham and flour. Form the mixture into balls about $\frac{1}{2}$ in. across and flatten them with a knife. Bake them for 7 to 10

minutes at 400 degrees. Use the smallest possible quantity of beaten egg or top milk if the mixture is too dry to handle.

Moulded Meat and Egg Salad

1 tablespoon of gelatine	Hard-boiled eggs—about one for each person
2 cups of stock	Mashed potato or finely-chopped cooked new potatoes
$1\frac{1}{2}$ cups (about $\frac{1}{2}$ lb.) of cooked minced meat	

Chop the hard-boiled eggs, add an equal quantity of prepared potato, and season them generously with chopped chives, parsley, salt, and pepper. Press the mixture into one end of a square tin, loaf tin, or pie dish. Soak the gelatine in $\frac{1}{4}$ cup of cold water, add the heated stock, and stir until the gelatine is dissolved. Chill it slightly and combine it with the minced meat, and mould it in the other half of the dish.

Serve the mould with quartered lettuce, tomatoes, radishes, or any salad vegetable in season, as illustrated in the heading photograph.

Fish and Green Pea Mould

2 cups of cooked peas	$\frac{1}{2}$ cup of cold water
1 cup of cooked fish	1 cup of hot water
1 teaspoon of grated onion	Salt and pepper
2 tablespoons of lemon juice	1 tablespoon of gelatine

Soften the gelatine in cold water, add the hot water and seasoning, and cool it until it is beginning to thicken. Flake the fish, remove bones and skin, and combine it with the lemon juice. Pour a little gelatine into a loaf tin, then arrange peas and fish in alternate layers. Pour the rest of the gelatine over and set the mould aside until it is firm. Garnish with hard-boiled egg slices, radishes, and lettuce and serve with salad dressing.

Moulded Sheep Tongues

6 sheep tongues	$\frac{1}{2}$ oz. of gelatine
3 hard-boiled eggs	Salt and pepper
2 cups of stock	Chopped parsley

Cook the tongues, skin them, remove gristle and small bones, and slice thinly. Dissolve the gelatine in the stock and pour a thin layer into a wet mould. Arrange slices of hard-boiled egg surrounded with chopped parsley, and stand the mould aside in a cool place. When the gelatine is set fill the mould with alternate layers of sliced tongues and hard-boiled egg, pour the rest of the gelatine over them, and leave it to set.

Carry these moulded foods to the picnic in the containers; take an extra plate and unmould them just before serving. Buttered bread rolls or slices of bread and butter, with plenty of lettuce, tomatoes, and salad dressing, make good accompaniments.

Fruit salads packed in screw-topped jars are always popular at an outdoor meal. Boiled custard or blancmange to go with the fruit will carry easily in jars, but junket is not satisfactory as it divides readily if moved. Jellies and moulded fruit dishes are good, too, the only difficulty being the present scarcity of jelly crystals and gelatine.



[Sparrow Industrial Pictures Ltd. photo.]
Ham cheesies, Scotch eggs, and meat balls.

Sowing and Planting to Keep the Border Full of Flowers

IN the third of this series of articles on the rules of good flower gardening J. P. Hudson, Horticulturist, Wellington, deals with the important principle, "Never miss a sowing or planting date."

A WISE old gardener, drawing on a lifetime of experience and observation, has said that the main spring and autumn plantings are not enough to keep a home flower border bright and colourful. These two main plantings each produce a wave of colour but leave the garden flat and dull during the two "off" seasons—in early summer and through the winter months, before the new plants start to flower.

This system of stripping a bed entirely, cultivating it, and replanting it at once with a fresh set of plants is usually referred to as "bedding." It entails propagating large batches of plants in pots or boxes in either glasshouses or frames to ensure that plants are ready at the required date, as the whole scheme depends on accurate timing. It is expensive, it takes much time, and its effectiveness depends on suitable plants having been raised as nearly as possible to flowering stage before they are planted out to reduce to the minimum the time when the bed is not in flower.

Mixed Borders for Home Gardeners

Bedding can be most effective, and the results of various schemes in the hands of the expert are shows of colour that cannot be surpassed, but elaborate bedding often gives poor results in the home garden and is, perhaps, best left to the public parks, the staffs of which have the facilities and knowledge to achieve a technical perfection that the home gardener cannot hope to reach.

The home gardener, with his eighth- or quarter-acre section and limited time and facilities, should not try to emulate the elaborate bedding schemes of the public parks. The foundation of the small home garden should be the mixed flower border, where there is always something in bloom and, in the milder districts, a really worth-while display of colour at every season of the year.

This border will require to be replenished from time to time, but replacements should be made gradually so that the ground is never entirely bare. Replanting should not be done when all the flowers are getting past their best, as in the bedding system, but young plants should always be growing up between those that are in full flower, ready to take their place when the old plants are past their best and ready to be pulled out. The time to plant for the next display is when the borders are at their best, and not when they have already faded.

A Cold Frame a Great Advantage

The old gardener's advice for keeping the borders constantly bright was: "Sow, plant, or propagate something every week of the year." That advice was given to home gardeners who had small glasshouses and need not, perhaps, be taken too literally by those who have only open ground, but the principle that a spate of planting twice a year is not enough to keep the borders perpetually bright still applies. With a home-made cold frame, however crude, a year-round succession of cuttings can be rooted to provide a reserve of plants for setting out in gaps that may occur, and there should be hardly any season when there is no box of seedlings waiting to be put out if required. The main sowings of annuals in early spring and of biennials in summer can be supplemented by boxes of useful flowers such as calendulas that can be raised and planted at any time of the year, and by self-sown seedlings of many kinds lifted from the border, pricked out into boxes, and grown on to make sturdy plants for setting out, though they will not usually be true to name or colour.



Pelargoniums are among the most useful stand-bys in the mixed flower border, as they can always be relied on to give a good display of colour in even the hottest weather.

In the summer the soil is often very hot and dry and planting out successfully is not easy, but even at this season early summer-flowering plants can be replaced if care is taken to water in the new plants and water again from time to time until they are well established.

Geraniums Insure against Dry Weather

One of the joys of gardening is to try out new plants, of which nurserymen and seedsmen now offer a growing range. But, however tempting the newcomers may sound, neglecting the old, tried favourites does not pay. Geraniums, pelargoniums, mesembryanthemums, gazanias, and Livingstone daisies can be regarded as the gardener's insurance against hot dry weather, as they will flower and flourish in the longest droughts. It is always wise to include a proportion of such plants, especially geraniums and pelargoniums, in every mixed flower border to make certain of a show of colour in the dry summer months.

Though gardeners are incurable optimists about new plants, it is the old, never-failing stand-bys that encourage further efforts. Every soil is fertile for some plant and, on the principle of easy things first, it is surely wisest to make the main feature of the plants that grow best, even if they are "common" and "ordinary", rather than risk a whole season of disappointment by growing a large number of some new and untried plant.

WORK IN THE FLOWER GARDEN



"Sow, plant, or propagate something every week of the year." A cold frame, however crude, enables the home gardener to raise a great variety of plants from cuttings and so keep the border well furnished.

Garden Work for March

A terrific gale blew in mid-February last year over parts of the North Island, and gardens where plants had not been properly staked never recovered from the effects of the storm. If the autumn flowers have still not been supported, they should be without delay, as described in detail last month. Many flowers, such as Michaelmas daisies, chrysanthemums, and dahlias, which have already been staked, may now need a second or third tie to support the developing flower spikes.

Boxes of seedlings and young plants growing now (see last month's notes) will provide a welcome winter and spring display of flowers. Care is needed in watering boxes of plants, especially in dry, hot weather, to ensure that none suffers from lack of water. The first essential is to have the surface of the soil level in the box, a point to be watched when sowing seed or pricking out, and also to have the box standing perfectly level. If water is seen to run to one side or corner when the box is first watered, a few plant labels or thin strips of wood should be slipped under the low side of the box to bring the soil surface level. Loose filling at the sides and corners of boxes is often the cause of the outside row of plants suffering from lack of water, as the outside soil dries out rapidly after being watered if too loosely packed. A rose should always be used on the watering can to prevent soil being washed from one part of the box to another, so spoiling the level surface essential for even watering.

Bulbs must be planted as early as possible if they are to give a good display in spring and every effort should be made to plant most of them before the end of March. The general rule is to plant bulbs so that their tops are about twice the diameter of the bulb below the surface. Ranunculuses and anemones are planted about 2in. deep, with the ranunculus claws pointing downward. For ease of lifting tulips are usually planted 3 to 5in. deep commercially, but it is often recommended that they should be planted much deeper in the home garden, especially where they can be left undisturbed for a number of seasons. Tulips planted 10in. deep in good soil have given very satisfactory results, and tulip fire disease is said to be much less troublesome where tulips are planted very deeply.

Close planting produces a massed display of blooms (the buds of which were already present in the bulbs when they were planted), but the finest bulbs for the following season will develop only if the plants are given ample room. A reasonable spacing is 9in. apart for bulbous iris, 4 to 6in. for ranunculuses and anemones, 6 to 10in. for tulips, daffodils, and narcissus, and 3 to 6in. for the smaller bulbs such as ixiads, sparaxis, babianas, lachenalias, and freesias, all of which are well worth a place in the mixed flower border.

Carnation plants become straggly and overgrown in a few seasons, and though they can be rejuvenated by pruning them hard, the old plants will rarely produce first-class blooms and often do not flower at all in the first

season after being pruned. The best plan is to discard them after two or three years and replace them with new plants, which are easily raised by layering border carnations or by cuttings of pinks and perpetual-flowering carnations. Layers or cuttings should be planted as soon as they are well rooted, being watered before being lifted and again after being planted if the soil is dry.

Chrysanthemum plants now showing flower buds can be used to make a colourful display in the house if they are lifted as carefully as possible from the borders, put in boxes, and taken indoors to finish blooming. The best way to lift them, causing the minimum disturbance to the roots, is to cut down each side of the plant about 5in. away from it with a spade, pressing the blade toward the plant, then lift the roots intact in the square block of soil so formed. To encourage large, shapely flowers, late chrysanthemums growing in pots should be fed regularly as recommended on page 326 of the "Journal" for September, 1947.

Cut back hard antirrhinums, hybrid wallflowers, marigolds, and marguerites that have exhausted themselves by summer flowering and become straggly. These plants should produce a winter display of flowers in the milder districts, to follow the last of the chrysanthemums, dahlias, Michaelmas daisies, etc.

Dahlia varieties cannot be recognised from the roots. Make sure that named varieties are properly labelled before the plants are killed by autumn frosts so that they can be kept separate later when the tubers are lifted. Plants should also be inspected for virus infection. Those which were severely stunted and dwarfed will probably have been dug out and burnt already, as they are useless, but plants with a milder attack, showing concentric rings and wavy lines on the leaves but growing fairly well, are often left to flower. However, these should be marked for destruction later and never saved for propagating, even though infection does not seem severe, as all the cuttings from such tubers will be heavily infected with virus, for which there is no cure.

Geraniums, like most other flowers, respond to regular removal of dead flowers, but deciding when to remove the flower stalks is not always easy. Each main stalk bears a bunch of flowers, the earliest of which usually fade and start to develop seed pods long before the later flowers in the truss have begun to open. Fortunately the seed pods stand erect while the opening flowers droop over. With a steady hand and a pair of kitchen scissors the seed pods can all be snapped off each head with one stroke when about half the flowers have faded, leaving the remainder of the flowers to open without weakening the plants by leaving developing seed

Pods. When the last of the flowers on a stalk are fading, the whole flower stalk should be snapped off.

Geraniums of all types are easily raised from cuttings, which root readily in summer and autumn. Pieces 3 to 4 in. long should be cut off the ends of sturdy new shoots and each cutting prepared by cutting off the bottom two or three leaves and then cutting back the stem with a razor blade to just below where the bottom leaf joined the stem. Put the cuttings 3 in. apart in light, sandy soil in a frame or even outdoors. Water them sparingly and only when the soil is really dry, as excessive moisture causes geraniums to rot, unlike most cuttings, which root readily only in a moist atmosphere and soil.

Gladiolus plants should continue to be lifted when the leaves show a marked change in colour, usually about six weeks after the flowers have faded (see article in the September, 1947, issue), and dried in an airy place preparatory to having the stems cut off and the corms stored away.

Hydrangeas are easily raised from cuttings consisting of pieces, with two or three pairs of leaves, taken in summer and early autumn from the ends of non-flowering shoots. Cut each just below the bottom pair of leaves, remove the lower leaves and about half the blade of each of the remaining ones, then insert the cuttings 1 in. deep in sandy soil in a frame. Keep them moist by damping them daily for the first few days and cover them with newspaper, but the paper should be removed as soon as the cuttings show signs of perking up. Hydrangeas which have been flowering in pots in the house and now have finished should be planted out into the garden.

Late summer is the proper time to prune hydrangeas in the milder districts, and the general principle is that shoots which have flowered should be cut out altogether, leaving the new shoots untouched to flower next spring. Much blossom is lost each year through hydrangeas being pruned too severely and new shoots shortened. If there are few new shoots, some of those which have flowered should be retained, but shortened by removing the spent flower head and a few inches of the stem from each. The shoots of hydrangeas are frost tender, and pruning should be delayed until early spring in districts which experience more than a few degrees of frost in the winter. Dead flower heads should also be left in place, as they help to keep the frost off the lower parts of the bushes. (Full details of hydrangea pruning, with diagrams, were given in the January, 1947, issue of the "Journal.")

Iceland poppies are perennials in the mountains of the far northern regions, which are their natural home, but in New Zealand they are grown as

annuals. Indeed, the newer varieties, with flowers of much better size, quality, and range of colour, seem almost to have lost their perennial character and few will survive the hot summer months even if they are left in the beds. Commercial growers plant in the summer for early flowers, but autumn is the best time to plant Iceland poppies in the home garden for a fine display of flowers in spring and



[Photo News Ltd. photo.]
A plant of *Liliun Henreyi*, a typical stem-rooting lily, showing the thick contractile roots formed below the bulb to pull the bulb down to the required level, and the mass of fibrous feeding roots growing from the stems above the bulb.

early summer. The soil should be limed before planting (4 oz. of carbonate of lime to the square yard).

Lawns that are badly infested with rosette weeds such as daisies, catsear, plantains, and dandelions can be cleaned up most easily by using one of the hormone weedkillers, but that should be done without delay, as these chemicals are effective only if used in warm weather. To avoid damage to garden plants when using hormone weedkillers the precautions that have frequently been stressed in these notes should be properly observed. The quarterly lawn dressing of three parts

... WORK IN THE FLOWER GARDEN

of sulphate of ammonia, two parts of superphosphate (one part on well-established lawns), and one part of sulphate of iron should now be applied evenly at the rate of 1 oz. of the mixture to the square yard.

Lily bulbs should be dug and replanted, where necessary, as soon as the stems die down; additional requirements should be bought in now. At this time of year the bulbs have fewest roots and can be moved with least disturbance, but as most start to root again almost at once there is but a short period in which the bulbs can be lifted safely. When planted in well-drained soil, rich in organic matter and free from lime, lilies should flourish for some years and require lifting and replanting only when they become really overcrowded. Stem-rooting lilies should be planted about 8 in. below the surface; varieties which do not root from the stem need be put only 3 or 4 in. deep.

Mimulus (*Diplacus*) *glutinosus*, a shrubby perennial which is easy to grow in the milder, frost-free districts, is worth a place for the value of its flowers for cutting. If long stems are cut, the lower leaves removed, the bottom few inches of stem slit up or beaten, and the soft tip (which soon droops in water) removed, a most attractive arrangement can be made that will last very well in water. The charm of this plant is the Spanish orange colour of its flowers (°10/1 in the Horticultural Colour Chart). Very few plants have flowers of this subdued but charming shade. *M. glutinosus* roots readily from cuttings taken from short side shoots in summer.

Planting out is an important part of the early autumn's work. Among the plants which can now be set out are shrubs and perennials rooted in a cold frame from cuttings taken in summer, plants raised from seed sown in boxes and beds, self-sown seedlings watered and lifted from various parts of the garden, and plants bought in from the nurseryman. All plants set out now should quickly become established in the soil, which is still warm after the summer, if they can be supplied with adequate moisture. That may mean watering them in and also watering from time to time until autumn rains have thoroughly wet the soil. A shower in late summer may give the impression of soil in good planting condition but often only wets the top of the soil, which may still be bone dry an inch or two below the surface.

Pot plants tend to become rather dusty in the summer and are sometimes attacked by red spiders, minute creatures which live on the under sides of the leaves in a loose web and cause foliage to turn brown and dry and the leaves to drop prematurely. It is a good plan to take all the pot

WORK IN THE FLOWER GARDEN



Livingstone daisies (*Dorotheanus (Mesembryanthemum) criniflorus*) will grow well and make a good display of colour in dry, sunny places.

plants out of the house two or three times a year, syringe them with white (summer) spraying oil at one per cent. strength (one tablespoon or two dessertspoons in five pints of water), allow them to dry, and then return them to the house looking very much fresher and more healthy. This treatment must not be given to plants, like carnations, the leaves of which are covered with a "bloom," as the oil spray will destroy the bloom.

Pot up a few rooted cuttings of balsam, fuchsia, geraniums, and pelargoniums into 3in. pots. These will make useful pot plants which can be grown quietly on through the winter in a windowsill and then repotted in spring into 5in. pots to flower and keep the windows bright all through next summer.

Sweet pea seeds can be sown outdoors where they are to flower in very favourable districts. That is perhaps the best way of raising the finest sweet peas but cannot always be followed, as the sweet pea site can rarely be got ready for seed sowing by this time. Therefore it is more usual to sow seeds in boxes later in the season and keep the seedlings in a frame or warm sheltered position until the soil is fit for planting in early spring.

Other Tasks for the Month

Thin annuals sown earlier.

Pot more bulbs to take into the house in winter.

Continue taking cuttings of violas, pansies, and geraniums.

Pot on young cyclamen plants, cinerarias, and primulas into 5 or 6in. pots where they can flower.

Divide and replant echeverias.

Lift, divide, and replant early-flowering herbaceous plants such as dornicums, trollius, and even Oriental poppies and delphiniums.

Sow new lawns.

There is still time to lift, divide, and replant **polyanthus** for spring flowering.

Reminders About Common Troubles

Rose diseases are fairly easy to control if attacks are noticed early and proper measures taken. The main diseases do not usually kill roses but lead to a serious loss of leaves, and as that reduces the efficiency of the bushes their general health and vigour may be seriously affected if proper control measures are neglected.

Black spot causes spreading black blotches on the leaves, which shrivel prematurely, and also affects the young wood, which becomes roughened and slightly lumpy. The disease can be carried over from season to season both on affected wood and by leaves which have been killed by the fungus. Therefore an important item in the routine of rose growing should be to see that all dead leaves are either collected or turned into the soil during the winter, and affected shoots cut off during pruning should all be burned.

Copper fungicides are most effective in controlling black spot. Bordeaux mixture (3:4:50) or copper oxychloride (1½oz. to 2 gallons of water) with a wetting agent added give a very good control if applied in the spring, when growth first starts, and repeated several times at intervals of two weeks. Copper dusts are much easier to apply, though it is doubtful whether they give such a high degree of control. Dusts are best applied in the very early morning, when plants are still wet with dew, and applications should be repeated every few days, especially after rain, as dusts are easily washed off the foliage. The rate of application should be such that the foliage is left covered with a thin film of dust, only just visible to the

naked eye. Lime sulphur, with or without the addition of colloidal sulphur, can be used for the control of black spot but is not as effective as the copper fungicides. An interesting article by A. G. Kennelly on the types of dusting and spraying equipment now available for home garden use was published on page 477 of the November, 1947, issue.

Powdery mildew gives a greyish appearance to the leaves and young shoots, which shrivel and die. As with most mildews, the best fungicide to use is one containing sulphur in some form. Lime sulphur (1 fluid ounce to each gallon of water) plus colloidal sulphur (½oz. a gallon) makes a most effective spray, or colloidal sulphur (½oz. a gallon) can be used alone.

Sulphur Fungicides

The mixture of lime sulphur and colloidal sulphur gives an extremely-effective control of powdery mildews, rusts, and other fungous diseases, and home gardeners are recommended to keep both lime sulphur and colloidal sulphur in stock. Bottles of colloidal sulphur should always be very thoroughly shaken before being used, as the sulphur tends to settle to the bottom.

Another cheap and effective sulphur fungicidal spray, suitable for use on almost any ornamental plants, as it leaves little unsightly deposit on the leaves, can be made up as follows: Dissolve 1½oz. of liver of sulphur in 14 pints of water; make 1½oz. of wheat flour into a thin, smooth paste with a little water, make it up to 2 pints, boil it until it froths, and add it to the liver of sulphur solution. This spray will give a reasonable control of most mildews.

All sulphur sprays discolour paint work with which they come into contact.

A Gull Took Flight

Out of the shining, blue serenity
Of quiet water, in the sunlit bay,
A flash of silver started like a flame,
Lashing its stillness into sparkling play—
A gull flew up, away
And I remembered how once, long ago,
Like a swift star flung headlong down the night
Love swept across the shadows of my dream,
Shattering their fetters in a blaze of light.
I lived—till love took flight.
The silent waters close and leave no scar
Where beating wings have rent them—even so
The drift of time flows over love's bright star . . .
Yet down life's secret ways a richer glow
Still lights the way I go.

—Jean H. Mather.



Useful Facts and Figures for the Kitchen

By EIRENE UNWIN, *Rural Sociologist, Dunedin.*

THE ability to convert the measures in a recipe from pints and ounces to cupfuls and spoonfuls, or vice versa, can be a great convenience, particularly in the absence of accurate scales. Not infrequently, too, a recipe or menu contains words of which the housewife may not know the exact meaning—in fact, it presumes that she has a certain piece of knowledge which she may not have. This article contains some of those useful little pieces of information which are often left out of printed recipes.

FOLLOWING are the weights of common ingredients and their equivalents in measures. All measures are level, and "cup" means a measuring or 8oz. cup, not a 10oz. one.

Ingredient	Weight of 1 cup	Tablespoons in 1 cup	Tablespoons in 1oz.
Sugar ..	8oz.	16	2
Butter or fat ..	8oz.	16	2
Liquid ..	8oz.	12	1½
Sifted Flour	4oz.	16	4
Flour as usually measured ..	6oz.	16	2½ to 3

The weight of a cup of flour depends on how closely it is packed. Usually, if a measuring cup is dipped into the bin and the flour scraped off

level down to the full-cup mark, the weight of this flour will be 6oz.

Here is an easy way to measure butter or fat: To measure 4oz. or half a cup, fill a cup with cold water up to the 4oz. mark, then push fat into the water until the level rises to 8oz.; tip off the water and there will be 4oz. of fat in the cup. To measure 3oz. put in 5oz. of water, to measure 4½oz. put in 3½oz. of water, and so on.

A measuring cup is half an American pint, not half an Imperial pint. An Imperial pint is 20oz. of liquid or 2½ cups; an American pint is 16oz. of liquid or 2 cups.

Numbers of Servings

Coffee: 1lb. of pure ground coffee=60 tablespoons. For black coffee use 1

tablespoon of coffee for each measuring cup of water; 1lb. of coffee yields 60 measuring cups of black coffee. For white coffee use 2 tablespoons of coffee for each measuring cup of water to make coffee essence; to 1 cup of this add 1 cup of hot milk to make 2 cups of white coffee; 1lb. of coffee yields 60 measuring cups of white coffee.

Cocoa: 1lb.=about 256 teaspoons, so it will make 256 cups using 1 teaspoon to the cup or 128 cups using 2 teaspoons each.

Tea: 1lb.=about 240 teaspoons and will serve about 130 people.

Milk for tea: Allow 1 pint for about 20 people.

Sugar: 1lb.=about 90 level teaspoons.

Bread for sandwiches: A 2lb. or half loaf yields about 28 slices—56 sandwiches of quarter-slice size, or 56 rolls if half a slice is used for each.

Butter: Allow 6 to 7oz. of butter for each 2lb. loaf.

Definitions

Following are definitions of cookery terms, processes, and products, many of which will be found in American recipes:—

Ingredients

Bouillon cube: A small cube of dried meat or chicken extract and seasonings

FACTS AND FIGURES FOR THE KITCHEN . . .

used with water to make bouillon—a clear soup.

Fillet: A long, thin, boneless strip of lean meat or fish.

Fromage: Cheese.

Lait: Milk.

Poisson: Fish.

Roux: A smooth, cooked or uncooked mixture of flour and butter or other fat, used to thicken soups and sauces.

Asperge: Asparagus.

Champignons: Mushrooms.

Haricots: Beans.

Maitre d'hotel butter: A mixture of butter and lemon juice, parsley, salt, and other ingredients.

Processes

Barbecue: To roast meat on a spit or rack over coals, usually basting it with highly-seasoned sauce.

Braise: To brown meat or vegetables in a small amount of hot fat and then cook it slowly in a closely-covered dish or saucepan on top of a stove or in an oven, adding a very small amount of liquid or cooking in meat juices.

Blanch: 1. To remove skins from fruit or nuts by allowing them to stand in boiling water from 1 to 5 minutes, draining them, plunging them into cold water, and slipping off the skins. 2. Plunging food into boiling water to reduce a strong flavour or set a colour.

Broil or grill: To cook directly under a flame or red-hot heating unit or over an open fire or grill.

Panbroil: To cook uncovered in a hot frying pan, pouring off the fat as it accumulates. The pan may be ungreased or rubbed slightly with fat to prevent the food sticking.

Parboil: To boil food in water until partially cooked.

Devil: To prepare with hot seasoning such as pepper or mustard.

Fricassee: To cook by braising; applied to foods such as poultry, game, and meats, cut into pieces.

Glaze: To make smooth and glossy with icing, thin syrup cooked to the crack stage, or jellies and jams.

Julienne: To cut vegetables into match-like strips.

Marinate: To add a marinade (oil-acid mixture) and let it stand to season the food.

Scallop: To bake a food, usually cut in pieces, in a casserole with sauce or other liquid. The top is usually covered with crumbs. Food and sauce may be mixed together or arranged in alternate layers.

Try out: To fry solid fat or fat meat cut in small pieces until the fat is separated from the membrane.

Products

Appetiser: A small individual portion of food or drink, served before or as the first course of a meal.

Aspic: A savoury meat jelly used to garnish meat or fish or to make a mould of meat or fish.

Bisque: A rich cream soup, usually of shellfish, or a frozen ice cream with nuts in it.

Canape: An appetiser made of fried or toasted bread spread with some highly-seasoned food.

Cocktail: An appetiser; it may be liquid (vegetable or fruit juice or alcoholic beverage) or solid (fruits or shellfish with sauce).

Consomme: A light-coloured, clear soup, usually made from a combination of meats.

Bouillon: Clear soup, made principally from beef stock.

Mocha: A flavour from coffee infusion, or a combination of coffee and chocolate.

Ragout: A highly-seasoned, thick stew.

Pilau: Rice stewed with meat, poultry or fish, and spices.

A la broche: Cooked on a skewer.

A la carte: Foods prepared to order, or each dish on a menu priced individually.

Au gratin: With cheese, or sprinkled with crumbs and/or cheese and baked brown.

Brioche: Light, sweet, yeast bread, characteristically French.

Chartreuse: A liqueur; a food mixture enclosed in a fancy case or mould.

Espagnole: A brown sauce of butter, flour, and meat juice.

Froid: Cold.

Gateaux: Small cakes.

Hors d'oeuvres: Relishes, usually served at the beginning of a meal.

Lyonnaise: Cooked with chopped onions and parsley.

Milanaise: Spaghetti or macaroni with tomato sauce.

Pate: A pie or pastry; paste.

Pate de foie gras: Goose liver paste.

Potage: Soup.

Rechauffe: Reheated.

In American Recipes.

A baking powder biscuit: A scone.

A cookie: A small cake.

A cracker: A biscuit.

1 cup of cake or pastry flour = $\frac{7}{8}$ cup of New Zealand flour.

1 cup = 8oz. or $\frac{1}{2}$ pint of liquid, butter, or sugar.

1 pint = 16oz. or $\frac{4}{5}$ Imperial pint.

Batters, Doughs, and Cakes

The tables at the foot of this page give the proportions of liquid or fat to flour to use in making batters, doughs, and pastries. Here is an outline of some of the methods:—

Batter Method

Sift the dry ingredients and add the liquid; add the fat (if any), melted, with the liquid or at the end. If the batter contains baking powder or cream of tartar and soda, stir until the ingredients are just dampened and no longer. For batters without baking powder prolonged beating and standing are not necessary.

Scone Methods

1. Cut or rub the fat into the sifted dry ingredients. Add the liquid gradually to form a soft dough. Turn it out and, kneading very lightly, form

BATTER AND DOUGH

	Proportions of Liquid to Flour		Examples
	By Volume	By Weight	
Pour batter	1 : 1	1 : $\frac{1}{2}$	Pancakes
Pour batter	1 : $1\frac{1}{2}$	1 : $\frac{3}{4}$	Pikelets, waffles
Drop batter	1 : 2	1 : 1	Gems, butter cakes
Soft dough	1 : 3	1 : $1\frac{1}{2}$	Scones, bread
Stiff dough	1 : 4	1 : 2	Pastry

PASTRY

	Proportions of Fat to Flour		Cooking Temperature (degrees F.)
	By Volume	By Weight	
Short	1 : 4	1 : 2	400
Flaky	1 : 3	1 : $1\frac{1}{2}$	450
Puff	1 : 2	1 : 1	500

4 of flour: 1 of liquid by weight for all pastries.

the mixture into a ball, then pat or roll it out, shape, and bake.

2. Cut or rub the fat into the sifted dry ingredients. Add all the liquid at once into a hole in the centre of the dry ingredients and stir vigorously until the mixture thickens—for about 20 seconds. Turn the dough on to a lightly-floured board, and without delay knead it vigorously for about 20 seconds. Pat or roll it out, cut, and bake.

Measure all ingredients carefully. Avoid over-mixing or over-kneading at first until sufficiently familiar with the method to know just how much is required.

Butter-cake Methods

Conventional method: Cream the butter, add the sugar, and continue creaming. Add the beaten eggs and flavourings, then the sifted dry ingredients alternately with the liquid (if any). If the eggs are to be separated, add the beaten yolks to the butter-sugar cream and fold in the beaten whites last of all.

Three-minute method: Cream the butter, then add all the ingredients except the raising agent, including unbeaten eggs, and beat for 3 minutes with a wooden spoon. Last, mix in the raising agent carefully mixed with 1 tablespoon of flour kept back for the purpose. Beginners are not advised to try this method.

Sponge-cake Method

Beat the eggs or egg yolks until they are thick and lemon coloured, add the sugar, and continue beating until the eggs are very thick and creamy. Fold in the dry ingredients and last, if the eggs have been separated, the stiffly-beaten egg whites. If there is any liquid—milk, water, or melted butter—add it alternately with the dry ingredients.

Deep-fat Frying

By noting the time required to brown a small cube of bread in hot fat, the approximate temperature of the fat can be judged. Here are some uses for this test:

Temperature (degrees F.)	Time to brown a small cube of bread	Foods to cook at this temperature
375	60 seconds	Uncooked foods, fish, cutlets, apple and banana fritters.
385	40 seconds	Cooked foods, rissoles, croquettes
395	20 seconds	Potato chips

Points to remember when deep-fat frying are:

Never have the saucepan more than half full of hot fat.

If the food put into the fat is wet, the water will immediately be turned to steam, which is likely to make the

fat "boil over." Therefore, if cooking moist raw food, such as potato chips, dry it on a clean teatowel first. If cooking fritters that have been dipped in egg or milk, see that they are well coated in crumbs of flour to absorb the moisture, and put them carefully into the fat one at a time.

Always cook small quantities at a time, as putting a large quantity of cold food into hot fat cools it down considerably and the product becomes greasy.

Drain fried food on absorbent paper before placing it on a serving dish.

If fat should catch alight in the saucepan, immediately cover it with a lid, plate, or sheet of cardboard to shut out the air; the burning cannot continue without air. If fat boils over and catches alight on the range, remove the saucepan if possible and cover the burning fat with a damp, not dripping wet, dishcloth or heavy ovencloth to shut out the air. Immediately turn out the flame of a gas range. Do not try to blow out burning fat or put water on it; either of these may make it worse.

Using Gelatine

One cup of liquid takes 1 tablespoon of gelatine to set it. If the liquid is very acid, increase the gelatine.

Gelatine mixture stiffens after it has set if allowed to stand several hours, so if it is wanted soon after it has set, use more gelatine; if it is not wanted immediately, use less gelatine. With an increased concentration of gelatine the time for setting is shortened. If setting the mixture in a refrigerator, use less gelatine unless it is wanted immediately.

Soaking gelatine causes it to dissolve more quickly, so it is usually soaked in a little cold liquid before the hot liquid is added.

Gelatine will not set if mixed with fresh pineapple juice. If the juice is brought to the boil, or if it has been canned, the non-setting effect is destroyed.

A whipped gelatine mixture should be beaten when still semi-liquid. At this stage the volume may be increased two or three times, as the gelatine is still elastic and stretches to surround air particles. If it is too firm, the gelatine breaks and so will not froth up.

If gelatine is boiled or heated to nearly boiling with milk, the milk will curdle. If that is not desired, cool the gelatine liquor before adding it to the milk. Similarly, add only fairly-hot milk to gelatine if it is to be dissolved in the milk, or preferably dissolve the gelatine in water or fruit juice before adding it to the milk.

... FACTS AND FIGURES FOR THE KITCHEN

Sugar Cookery

As sugar and water are heated the temperature rises well above the boiling point of water (212 degrees F.). Every few degrees a new stage is reached, and these stages are difficult to recognise without a sugar or "candy" thermometer. The following are the stages:—

	Degrees F.
Small thread	215
Large thread	217
Pearl stage	220
Large pearl	222
Blow stage	230
Feather stage	232
Soft ball (fudge)	238
Hard ball	248
Small or soft crack (toffee) ..	290
Hard crack (toffee)	310
Caramel	350

As soon as the caramel stage begins the syrup rapidly gets darker brown and is, in fact, burning. If that is allowed to happen, the flavour of toffee is spoilt.

The "soft ball" and "crack" refer to the effect of putting a drop of the hot sugar syrup into cold water. When the right temperature for fudge is reached the drop stays as a drop and can be picked out of the water as a soft ball; when it is ready for toffee the drop at once turns hard and brittle in the water. While testing this drop remove the saucepan from the heat so that the temperature does not increase meanwhile; that is particularly important when the syrup is nearing the caramel stage.

When cooking sugar to make sweets, wash down the sides of the saucepan if, in the early stages of boiling, crystals form on the sides. These may cause sugariness if not washed back into the saucepan.

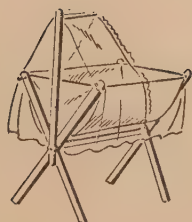
Toffee should be non-crystalline, therefore do not stir after the syrup comes to the boil, pour it out to set as soon as the right temperature is reached, and leave it undisturbed to harden. The addition of a little acid helps to prevent the formation of crystals.

Fudges should be crystalline but contain only very small crystals, so that the texture is not rough or granular to the tongue. The formation of these crystals is influenced by beating, temperature, and the addition of some foreign substance. Beating while crystallising is occurring helps to make the crystals small. If the syrup is beaten too hot, the crystals will be large, so cool the mixture to 110 degrees F. (just warmer than blood heat) before beginning to beat it. The addition of small quantities of acid or glucose causes small crystals but too much prevents crystallisation, so never exceed the quantities of these given in the recipe.



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Don't dismiss that
tired feeling too
easily. It can cause
lots of trouble, not
only to you but to
others.

FATIGUE

FATIGUE causes accidents at home, at work, and on the highway. FATIGUE lowers resistance and makes you more susceptible to disease.

Unusual or chronic fatigue is serious. It may be the first sign of disease, such as tuberculosis or anaemia, or vitamin deficiency.

You can control fatigue and its hazards:

Get adequate sleep.

Eat proper foods at the proper time and in the right proportion.

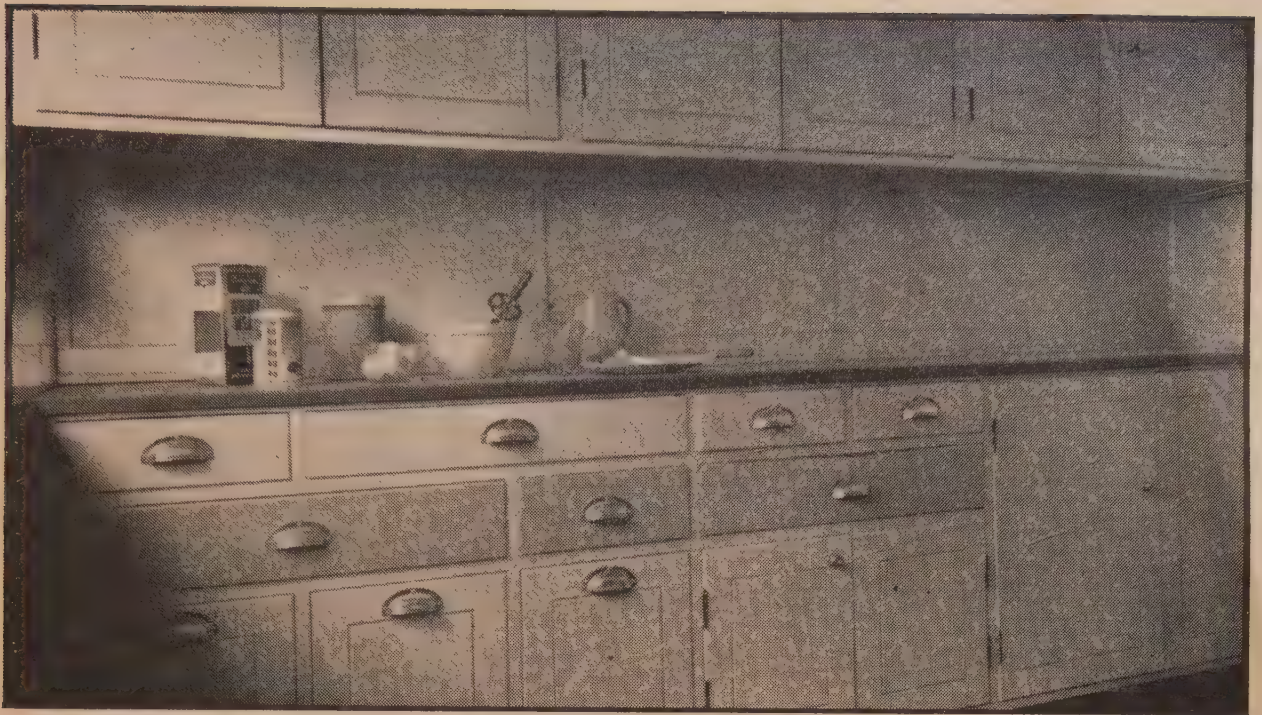
Don't skip a meal—going without breakfast is asking for trouble.

Take time off for wholesome and easy recreation, and relax whenever you can.

If your fatigue is hard to explain, or difficult to control, consult your doctor.

ISSUED BY THE DEPARTMENT OF HEALTH

8/47



A Place in the Kitchen for Making and Baking

By NORMA K. METSON, *Rural Sociologist,*
Wellington.

BAKING day in the home is not what it used to be. Many ingredients are in short supply and must be used carefully, and conservation of all foods is now more to be admired than lavishness in their use. But delicious odours still come wafting from farm kitchens, small hands still reach up for bowls and spoons to scrape, hungry 'teenagers raid the tins on their return from school or hover round the oven ready to pounce on the crisp biscuits which emerge, and the housewife can point with pride to the cakes which she creates for local festivities or special family occasions. Recipes are always changing hands—austerity types for use now, exciting new ones gleaned from many sources and hoarded carefully in anticipation of the pleasant days when they can be tried.

THE need for keeping good supplies on hand to cope with hearty outdoor appetites, seasonal and casual workers, unexpected visitors, and the remoteness of shops make all New Zealand farm wives adequate cooks; much-tested recipes, abundant butter, eggs, and cream, high standards of housekeeping, the organised competition of the shows, and the informal rivalry of local gatherings have fostered many superlative ones. And all this often with singularly-inadequate equipment, so that reflection on what would be produced with truly modern facilities, such as a refrigerator, an electric mixer, and a thermostatically-controlled oven is a pleasant pastime.

If a separate working surface, away from the sink, is provided for food processes which require little or no

water, the sink bench is freed from an undue burden and the kitchen table need be used only for the overflow. Baking is not the only activity assigned to this useful centre. Think of having a place to prepare packed lunches with bread, butter, sandwich fillings, greaseproof paper, and the necessary small containers all within reach instead of distributed about the room; somewhere apart from the long-suffering sink bench to set out the plates when individual salads or cold desserts are being made; and a place to put all the jugs, bottles, dishes, and food supplies when the shelves of the safe or refrigerator must be cleaned out.

General Arrangement

The mixing centre may be built into a continuous set of benches and cupboards or it may be planned as a separate unit, isolated perhaps by a door or window from the other working areas; that is one way of overcoming the architectural difficulty created by the lower working surface and slightly-greater bench width which are appropriate for this centre. Another method is to have full-length cupboards or the refrigerator at the ends of the bench so that again the surface is separated and no awkward change from one bench type to another is necessary.

It is assumed in this discussion that a refrigerator is part of the kitchen equipment. It is not in the majority of homes, though it should be regarded as a necessity and undoubtedly would be bought by more families if supplies were greater and prices more reasonable. At present it is one of the first "extras" to be acquired, and then its usefulness is often considerably reduced by its being put in a storeroom or even on the back porch because there is no room in the kitchen. That is especially the case in a modern room where all available wall space has been used for cupboards. So a refrigerator or space for it (a 6 cubic foot size) should be included in the plan. The appropriate place is at one end of the mixing bench with the door handle on the side nearest the bench, so that the door opens out from the bench and does not have to be



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Survey will Help Dream Houses to Materialise

PLANNING material houses is highly-technical work—fitting a convenient and comfortable frame around family needs, yet all the while keeping within the limits imposed by materials and money. But planning dream houses is a popular pastime, so popular that the disappointments arising when schemes just will not work out in terms of wood and concrete are all the more bitter.

ASK people to describe these dream houses and they will often be vague and inarticulate—"lots of windows," "a kitchen we won't mind having meals in," "somewhere for the children to play inside"—but ask them definite questions and they will reply with a wealth of specific suggestions evolved from long years of makeshift and doing without. Give them practical ideas and they will speedily adapt them to their own needs.

It is with these points in mind that the Rural Development Division of the Department of Agriculture is carrying out a survey of rural housing. The information obtained will be analysed and passed on to architects and research workers, who will be able to use it in designing new and improved houses suitable for New Zealand conditions. Bulletins of plans and suggestions will be made available by the Department.

If you wish to help in this important work, all you need do is write to your nearest Rural Sociologist for a questionnaire, then fill in and return the form which will be sent you. Or perhaps you belong to a group interested in local welfare or national problems; would it not be a worth-while project for the members to obtain a full muster of completed forms for the houses in your locality?

Write now to:

THE RURAL SOCIOLOGIST, Department of Agriculture,
Auckland, Wellington, Christchurch, Dunedin.

... MAKING AND BAKING IN THE KITCHEN

reached round. Doors of cupboards should be hinged to open similarly in relation to the benches at which their contents are to be used. In addition to the refrigerator, a floor-to-ceiling ventilated safe or cool cupboard located elsewhere in the kitchen—for example, at one end of the sink bench—is necessary.

The general design of the mixing centre will include the bench with bins and drawers below, refrigerator at one end, a floor-to-ceiling cupboard at the other, and possibly shallow cupboards above the bench. The amount of storage and work space will vary with the number in the household and may be adjusted by varying the size of the work bench and tall cupboard and the number of top cupboards. Typical sizes are: Bench 24in. wide, 36 to 48in. long; top cupboard 20 to 24in. long, 10 to 12in. deep (if there is no window, this cupboard may extend the whole way across the bench); floor-to-ceiling cupboard 20 to 30in. long, 18in. deep. Floor space about 2ft. 6in. square must be allowed for the refrigerator, which should have one side free of walls and cupboards or a clearance of at least 3in. on all sides to allow circulation of air around it.

It is essential that the bench surface be easily cleaned, with rounded corners and no cracks in which food or crumbs can accumulate. Inlaid linoleum, terrazzo, plastic sheathing, or a durable enamel-type paint on hardwood is satisfactory. It is also possible to insert a marble slab for pastry-making (the top of an old washstand is excellent).

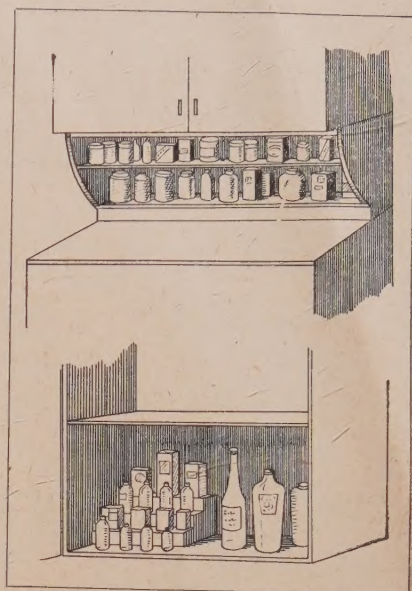
To protect the main surface and simplify cleaning, separate boards for baking, chopping, and bread cutting may be used and kept in slots below

or at the side of the bench. This is also the place for a pull-out board, firmly wedged, to hold the mincer if there is no convenient table edge or shelf elsewhere.

Storage

A considerable proportion of the kitchen storage, especially of food-stuffs, is allocated to this centre, so careful plans must be made for stowage. The refrigerator is used for dairy products, uncooked meat, leftovers, other very perishable goods, and foods which need to be chilled or frozen before being served. A set of special containers with lids is often supplied with the refrigerator, and some models provide additional storage facilities such as racks on the back of the door, a bin below the refrigerated compartment, or a special division for vegetables or frozen foods.

The natural location for the drawers and bins which hold the staples—sugar, flour, cereals, and bread—is below the work bench. If flour and sugar are bought in 50lb. and 70lb. lots, two of these bins will need to be large; the others can be made smaller or partitioned to hold the items which come in packets or are bought in smaller quantities—bran, breakfast cereals, wholemeal, and the different kinds of sugar. Some of these can be kept in their original containers and stored on a shelf, others are better emptied into a tin or jar so that they can be kept airtight. The ideal arrangement is a set of small metal-lined drawers with roll tops, such as are sometimes seen in chemists' or grocers' shops—a separate drawer for each item—but such a fitting is very expensive and difficult to work into the

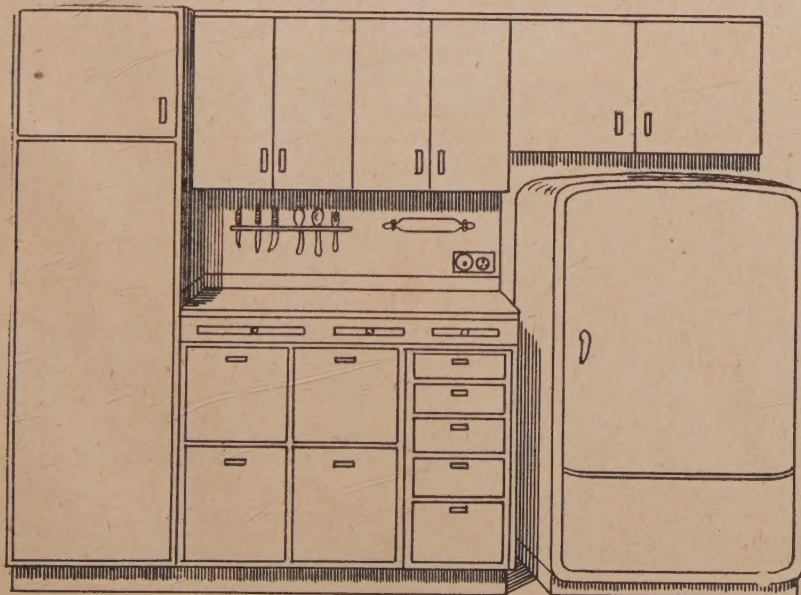


Two ways of storing small containers.

kitchen plan. A bench 4ft. long will allow room for four large drawer-bins, or six smaller ones, and a tier of graduated drawers. The shallow upper drawers can be partitioned and used for small things such as biscuit and parsley cutters which will not hang easily; the lower ones can be used for kitchen paper—greaseproof, serviettes, etc.—possibly recipe cards, books, and aprons, or they can be metal lined for cakes and scones.

The spatulas, wooden spoons, knives, measuring cups, and spoons which are often in use are most convenient in a rack or hanging on the wall at the back of the bench below the top cupboard. This space will be 16 to 18in. high and 3 to 4ft. long, which gives room for a lot of small items. If they are preferred out of sight they may be hung inside the door of the tall cupboard or kept in shallow, partitioned drawers. Many items are already equipped for hanging, and with a little ingenuity a rack can be devised for the others—an intermediate stage between a toothbrush holder and a tool rack.

The top cupboard is for all the food items kept in fairly-small quantities, such as baking and custard powder, gelatine, sultanas and currants, spices and essences—the list is long and need not be detailed. It is very desirable to have adjustable shelves in this cupboard so that space is not wasted above the small packages, but some tall space must be left for bottles of sauce and vinegar, 7lb. tins of syrup, and similar items. This fits in conveniently on a lower shelf where one corner is occupied by a step-shelf for



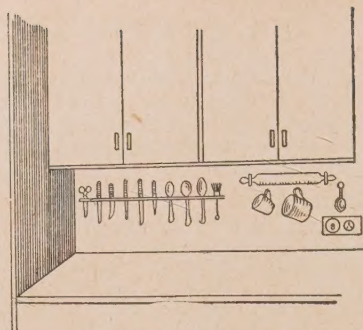
A general outline of the arrangement for the baking centre.

MAKING AND BAKING . . .

the spices, herbs, and essences. Another way of dealing with these small, uniformly-sized containers is to have racks into which they fit on the back of the cupboard door, but that is not possible if sliding or roll-up doors are chosen.

The floor-to-ceiling cupboard is necessary to hold all the larger utensils and to avoid the stacking of any but those of similar size. Scales and weights, mixing bowls, cake tins, gem irons, muffin pans, pie dishes, moulds, and any food containers too large for the top cupboard will be kept there. Tins of cake and biscuits for current consumption can have a special shelf, and it is a good idea to have one or two of the shelves only half width or U-shaped so that articles on the shelf below can be reached more easily.

Somewhere at this centre—in a special cupboard above the refrigerator



Making use of the wall behind the bench to store kitchen utensils.

or on the top shelf of one of the other cupboards—is the best place for the “emergency hoard” where reserve supplies of tinned foods, quickly-made packaged puddings, cracker biscuits, savoury spreads, and some bottled fruit are kept so that unexpected guests can be provided with a meal or

snack without trouble and the family can sometimes be given an unexpected treat. Experience and availability will determine the choice of supplies, but the value of this shelf is that it is always ready, so be sure to replace any item as soon as it is used.

A power point for two plugs should be installed at one end of the back wall, one for the refrigerator and the other so that an electric mixer or toaster can be used. The bench becomes a much pleasanter workplace if it can be built below a window, but that will limit the cupboard space and may not be possible in the general arrangement of the room. A small strip light set in the wall or under the top cupboard is another refinement.

Work surface and storage are even more closely related than usual in this unit, and the housewife should be able to modify this basic plan in many ways to suit her own room, equipment, and habits of working.

Crochet Mat for Wagon or Tray

A TOUCH of luxury is lent to a meal on a dinner wagon or tray by this lace-like patterned crochet mat. Worked with a No. 1½ crochet hook, three 2oz. spools of coarse cream cotton will produce a mat 22½in. by 13½in.

Abbreviations used in the instructions are: Ch. = chain; d.c. = double crochet; tr. = treble; sl. st. = slip stitch; rep. = repeat; st. = stitch.

Work 96 ch. First row.—* Miss 3 ch., then into next st. work 1 d.c., 3 ch., 3 tr.; rep. from * to end, turn with 3 ch.

Second row.—Work 1 d.c., 3 ch., and 3 tr. into every 3 ch. of previous row, turn with 3 ch. Rep. last row 4 times more. Fasten off. Rejoin cotton to the beginning of work and work along

the foundation ch. as given for second row, working into every fourth st. Rep. second row 5 times more. Fasten off. Join cotton to the centre of one of the short sides and continue as follows:—First round.—Work 5 ch., 1 tr. in d.c. of previous row, * 2 ch., 1 tr. in next tr. of previous row, 2 ch., 1 tr. in next d.c. of previous row; rep. from * until corner is reached, then into the corner work 1 tr., 2 ch., 1 tr. Continue all round, finishing with 2 ch., then join with a sl. st. into the third of the first 5 ch. Second round.—5 ch., 1 tr. in first tr., * 2 ch., 1 tr. in next tr.; rep. from * until corner is reached, then into the corner work 1 tr., 2 ch., 1 tr. Continue in that way, working each corner as first, all round, finishing with

2 ch. then joining with a sl. st. into the third of the 5 ch. Rep. this round 4 times. Seventh round.—3 ch., 3 tr. in first space, * miss one space, into next space work 1 d.c., 3 ch., 3 tr.; rep. from * until corner is reached, then into the corner work 1 d.c., 3 ch., 1 d.c., 3 tr., miss the next space and continue until the round is finished; join with a sl. st. into first d.c., turn with 3 ch. Eighth round.—Work 1 d.c., 3 ch., 3 tr. into each 3 ch. of previous row until corner is reached, then into the corner work 1 d.c., 5 ch., 1 d.c., 3 ch., 3 tr., continue all round, join with a sl. st. into first d.c., turn with 3 ch. Rep. last round once more. Tenth round.—As first round. Rep. the second round six times. Seventeenth round.—As seventh round. Rep. the eighth round five times. Fasten off. Press work on the wrong side.

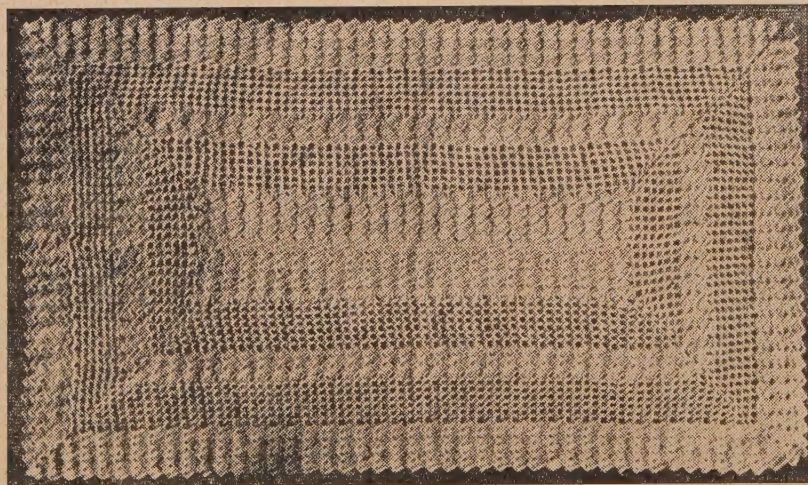
This cloth can be made in various sizes. For a larger cloth continue working the eighth round until the required measurements are obtained. A smaller cloth can be worked by omitting the last 13 rounds of the directions. Finer or coarser cottons will produce smaller or larger cloths without alteration to the pattern. Should finer cotton be used work with a finer crochet hook.

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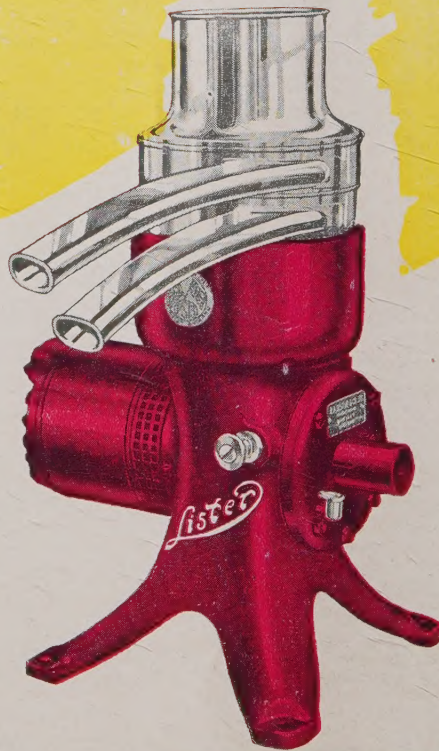
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